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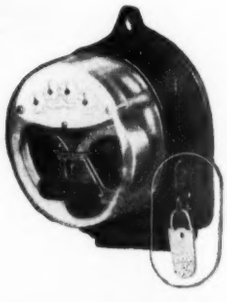

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# Electrical World

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# Electrical World

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L. W. W. MORROW, *Editor*

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## *Disclosing the Causes of Accidents*

ONE phase of the electrical industry that receives neither the credit nor the attention it deserves is experience with respect to electrical accidents. No good would ensue from the terse weekly publication of accident statistics except possibly to establish as a fact the conjecture that electrical accidents, especially fatalities, have declined absolutely as well as relatively. Improved tools and technic, better line and station construction methods, rules for and instruction of employees and education in resuscitation have all contributed their share toward healthier conditions.

But there still are unfortunate accidents, and many of them still carry a lesson that should not remain in local concealment. One is prompted to suggest that the N.E.L.A. accident prevention committee could well enlarge its activities in the direction of digesting periodically the significant casualties of the country and associating them with the moral they could contribute to the commendable program of accident elimination. Some of the public service commissions are very thorough in their investigations, the coroners occasionally emit a constructive suggestion, the insurance interests have facts galore, and the utilities themselves should be counted on to keep the lists complete and valuable. Let a means be found of giving zest and value to a program of accident prevention that may otherwise degenerate into the innocuous desuetude of mere preachment and generalities.

* * * *

## *Comparative Weakness of Banks and Electric Utilities*

IT IS axiomatic that things to be compared should be comparable. To be sure, banks and electric public utility corporations have little in common. One deals in money and the other in electric service. But they both seek the good will and confidence of the public, without which success in either instance is dubious. Now, if there is any one group, outside that of politicians and professional agitators, which has been audibly critical of public utilities and has issued warnings against their financial set-ups, it is the bankers'. Not the investment banker, whose business it is to investigate, sponsor and market utility securities, but that larger group of men engaged in banking, many of whom are the acclaimed or else the self-appointed leaders in village, town or community life.

These Jeremiahs, happily more vocal than numerous, foresee and have predicted the crash of many public utility corporations and yet are seemingly oblivious to what is actually happening in their own industry. Twenty-four banks in Florida failed within a recent fortnight, fifteen in a single day, and R. G. Dun & Company report a sharp increase in banking suspensions in the United States for the second quarter of 1929. Of the 148 suspensions, with liabilities of $54,000,000, during that time, sixty-seven were in Nebraska, with an indebtedness of $19,000,000; twenty-one were in the South Atlantic States, with liabilities exceeding $10,000,000, and the only section with a clean record was New England. Certainly, this electric light and power industry does not glory in this showing, nor with an almost clear record for the past two years does it assume any holier-than-thou attitude. It merely suggests that its banker critics compare scores and ask, not, "What is the matter with the electric utilities?" but, "What is the matter with the banks?" Maybe Senator Norris can explain what is happening in Nebraska and why the utilities there are so much better and safer than the banks.

Of course, there is the bare possibility that the public utility men of Nebraska are better business men than the bankers, or it may be a case of "truth forever on the scaffold, wrong forever on the throne." Who knows? Let us consider the record, however, and not throw stones.

* * * *

## *How Much Investment Dilution Is Wise?*

THROUGH the purchase of industrial firms by the parent holding company in a power group a portion of the investment is today being diluted in some of these enterprises from a strict light and power distribution. Diversity of business is being increased, but is this policy one which can be continued and expanded without sacrifice of some portion of the stability which has so long been fundamental to the public utility industry? There is probably no single answer to this question, but it is sufficiently important in considering credit strength and security appeal to justify frank treatment by holding-company managements which are making commitments in this direction.

Charters authorizing holding companies to engage in many lines of business outside the operation of light and power subsidiaries are plentiful enough. The question of legality need not be raised. The customer of the subsidiary property is indirectly concerned in any steps which may be taken by the holding company to acquire valuable water-power rights or to enlarge power markets through industrial plant purchases, since ultimate savings in operating costs and increases in gross through power sales tend to bring about lower rates in the long run. The action of the holding company may affect the subsidiary for good or ill over a given period, but the investor's interest is more immediate in the policy of

gaining control of local manufacturing businesses. It may be urged by some that the investor's objectives are his own and he needs no nursing care, as it were; but the reputation of the power industry in all its aspects is built up in a thousand different ways, and the stability of its securities is its pride in looking backward, its satisfaction in the present and its hope for future development under private as against political ownership.

The purchase of a controlling interest in a local industry by a utility holding company has been undertaken in a number of cases for the purposes of adding useful water-power rights to the utility system, to save "slipping" concerns from financial disaster, to sustain employment and community welfare, safeguard power markets and to apply modern business methods to establishments open to such improvement. It is evident that several cases of this sort have resulted in keeping concerns at work which would have gone upon the rocks had they not fallen into such strong hands, and that the holding company directors responsible for such decisions have thus contributed materially to the public welfare. On the other hand, the uncertainties of competitive business cannot be overlooked, and the stability of the holding company investment under this dilution of equities over a period of years may or may not have been impaired somewhat by the expansion program. It is a fair assumption that the analysis of investment equities and prospects which is demanded by an increasing number of security purchasers in the present-day market will require more detailed justification of industrial-plant purchases in the future than has been the case in the past.

* * * *

## *Why "Log" C. F. S. Flows?*

AS OPERATING methods in hydro-electric systems gain in precision it is important to "miss no bets" in controlling the use of water in the efficient production of kilowatt-hours. For many years steam plants have been checking fuel consumption against outputs on station log sheets, and it would be a rash engineer who would attempt to minimize the savings in coal or oil per kilowatt-hour which have resulted from this periodic accounting of resources and performance over a given term. Such data are as essential to keeping close "tabs" on a plant's efficiency as temperature and pulse readings are to the victory of a hospital patient over physical deterioration. In the hydro-electric field it is to be feared that not a few plants are still operated without adequate detection and diagnosis of adverse conditions affecting the use of water, although plentiful cases can be cited where a sharp instrumental watch is kept over flowage in all its phases.

Reasonably accurate accounting for stream flowage at every point of utilization involves facilities for measuring the cubic feet per second passed through all penstocks or wheels, including turbines driving both generators and exciters, and the preparation of data in tabular or chart form showing the volume of c.f.s. wastage when conditions force the use of spillways and floodgates with or without flashboards. It is customary in some cases to convert these data into kilowatt-hour equivalents, so that the system operator can report at any hour upon executive inquiry the approximate number of kilowatt-hours of storage on hand above any particular intake and can also translate rainfall reports over given watersheds into prospective plant production. Provision of facilities for "logging" c.f.s. as these units pass through or past plants furnishes a means of checking machine performance against raw material, so to speak, and thus to reveal incipient conditions in wheels, headworks and tailraces which may create monetary losses far out of proportion to their apparent importance in the handling of interconnected stations and lines.

Even a slight decrease in equipment efficiency at a critical point in an interconnected system load curve may force the operating department to buy expensive primary power or to throw distant fuel-burning apparatus on the line at a poor load factor. In a word, minor slumps in efficiency tend to be magnified on an amazing scale in certain cases, and these may easily occur often enough on a single system to justify a much larger outlay for c.f.s. measuring devices than would be the situation in a plant isolated from a regional load burden. The value of being able to build up a long series of c.f.s. flowage data at a given point in relation to reservoir and river stages over a protracted period is very great when such information is properly articulated with the kilowatt-hour performance of the installation.

* * * *

## *What About Engineering in Subsidiary Utilities?*

A HOST of problems accompanies public utility mergers and purchases by holding companies. Numerous important questions must be answered regarding policies and organizations, and among these, engineering in subsidiaries requires early consideration. To some holding groups, believing in decentralized management under financial control, the temporary continuance of the previous engineering set-up is a matter of course. As time passes there tends to be a closer co-ordination of standards and methods among the subsidiaries as their engineering staffs become mutually acquainted and familiar with varying conditions on different properties and almost inevitable changes in personnel. On the whole, the development of a new engineering set-up in a management or financial group of this type is a more gradual affair than in cases where the holding company headquarters takes the steering wheel from the start.

These latter instances sometimes turn the organization of the subsidiary literally upside down during the period of acquisition. In a representative case where the operating department formerly devoted a good deal of time to engineering, including the design of substations and various line construction work, the new régime assigned this work to the headquarters engineering office, so far as designing went, and established a group of engineers on the subsidiary property for both local and regional service. In this way the designing all "headed up" at the home office and the operating organization was realigned to devote its time to routine maintenance of service and such construction work as would naturally be carried out in expanding the distribution system according to the standards of the main office.

The headquarters engineers were placed on the property as a matter of geographical convenience, and they function as members of the main office staff. This arrangement enables the personnel of the latter staff to be shifted between properties as field work requires without interfering with the regular routine of the force on the subsidiaries formerly doing engineering work along with their operating tasks. The location of staff engineers on subsidiary properties tends to make the main

office more responsive to local needs and conditions than where such work is handled at arm's length, and the organization of various committees within the holding-company group having memberships made up of leading men in subsidiary departments helps the work of standardization, so necessary to realize the full benefits of centralized management.

* * * *

## *The Motor and Its Control a Unit*

ONE tendency that seems to be difficult to correct is that of industrial motor users to treat a motor and its control as two independent entities. Admittedly, several types of control can usually be adapted to a given motor and *vice versa*. The important fact is, however, that the user seldom is concerned with possible permutations and combinations. He has a particular load and it needs an appropriate motor.

Many of the loads lend themselves to direct application of the conventional combinations of motor and control. The continued increase in the electrification of industry has converted to the electric drive an increasing proportion of drives calling for duty on both motor and control that departs from the stereotyped installations. It is more necessary now than ever to analyze the job from the standpoint of starting, acceleration, speed change or control, dynamic braking, overload and other protection to ascertain just what to buy or, better, what to be sold.

The motorizing of industry is still a specific engineering job and no mere order-taking procedure. The best motor and control for the job will be obtained when an industrial engineer who knows his load requirements matches notes with the motor sales engineer who knows the performance possibilities of his line of motors and controls.

* * * *

## *The Cross-Sectional Mind in Public Affairs*

FORTY-THREE men with engineering training of greater or less degree were recently listed by the American Engineering Council as either occupying or having recently relinquished important posts, elective or appointive, in federal or state government. The list ranged from President Hoover down through governors, cabinet members and their assistant secretaries, senators and representatives. It showed a great increase in ten years in the technically educated men serving in conspicuous public places, and as it is just about a decade since the exhortations to engineers to grasp every opportunity to do this very thing waxed loud, the vocal seed may be said to have fallen on fertile ground. It probably indicates that an equally great increase has taken place in the number doing public work in smaller but often quite as useful capacities—tasks that bring no fame and frequently no money, but in which not only good citizenship but also a high grade of engineering ability can be displayed to the benefit of whole communities.

Woodrow Wilson once confessed that his mind was a single-track one. Such a mind can be driven far by will power. Single-track minds are needed, but if all men possessed them, collisions on the way would be more frequent than arrivals at the selected terminal. The typical—or perhaps one should say the ideal—engineering mind is different. It is cross-sectional rather than unilateral. It sees the ordinates as clearly as the abscissas. It is actuated by the logic of facts, not the delusion of fixed ideas. It will deviate if necessary; it will compromise if it has to. It will do the utmost to carry a well-conceived project through to realization, but it prefers the *via media* to a shattered dream, the *modus vivendi* to a deadlock, the hypothesis that works to the demonstrated theorem that refuses to work. It will construct no engines to break down bulwarks of political safety, nor, on the other hand, will it erect structures that stand proof against the engines of progress. Its blueprints will not be Medean edicts nor its specifications something for which to die. But if any of the eternal verities of mathematics can be shown to adhere to public life, the political slide rule of the ideal engineer will be built upon them. At any rate, he may surely be trusted to hold in abhorrence, on one side, scamping, gingerbread, tinsel and pretense and, on another, flattery, self-seeking, lying and the slavish mind.

* * * *

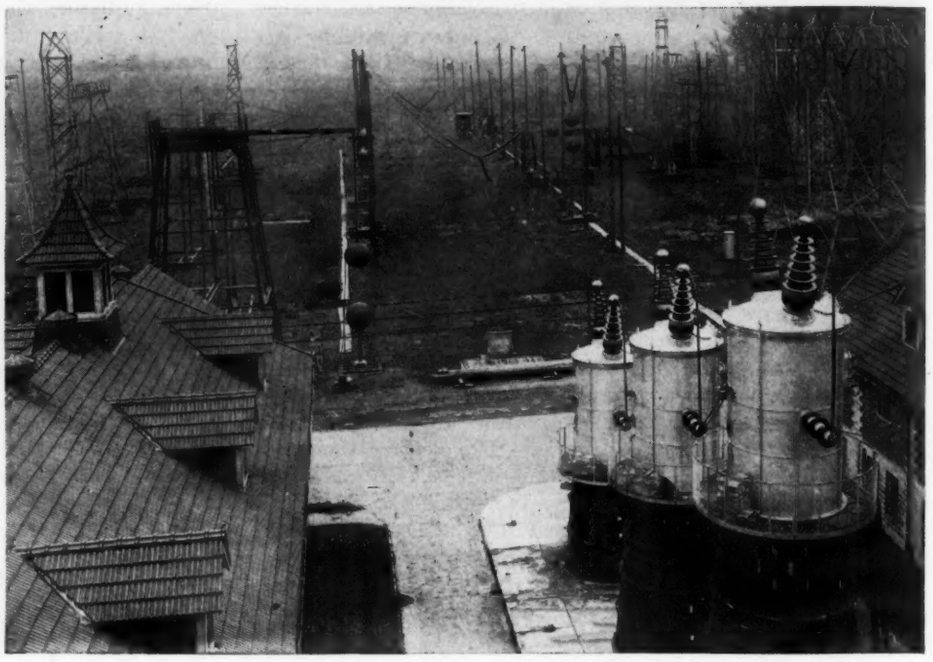
## *Deaths from Refrigerant Fumes Demand Action*

SEVERAL recent deaths in Chicago and other places in the country have been attributed to the undetected leakage of methyl chloride from domestic refrigerators. Just recently a triple death in Chicago caused Health Commissioner Kegal to place a ban on this refrigerant and issue the statement that he would do all in his power to stop the use of any unit employing this gas. News accounts of these deaths—especially the three just mentioned—have had prominent positions in local newspapers and have even been reproduced in distant cities with editorial comment.

It is not difficult to imagine the reaction of the general public to these accounts. Laymen cannot be expected to know that all refrigerators do not use the same gas. They hastily conclude that all electric refrigerators constitute a dangerous hazard. Electric refrigeration, which has already done so much to prevent spoilage of food and to protect health, which has won such ready acceptance as a household convenience, and which offers one of the best opportunities for taking domestic electric service out of the unprofitable class, may be facing a setback that years of selling effort will not counteract, unless convincing precautions are immediately taken to prevent repetitions of these fatal accidents from gas.

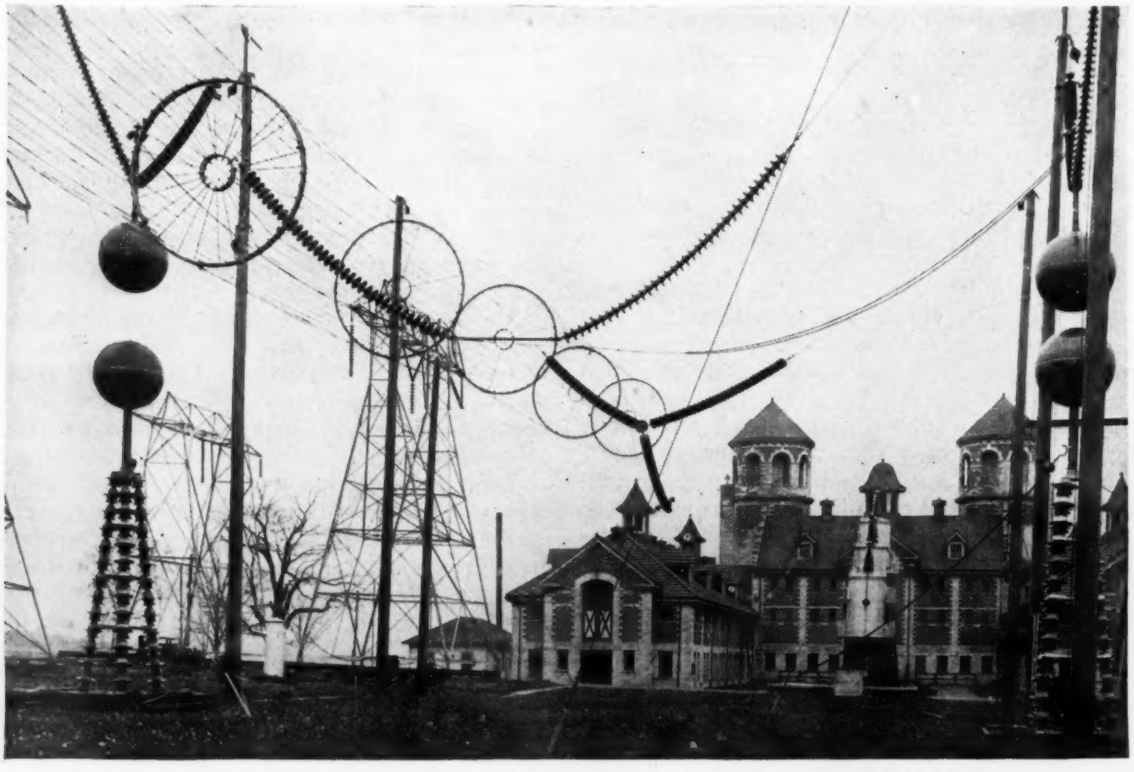
Since gases suitable for efficient refrigeration are limited in number, however, putting a ban on methyl chloride is not the solution except as a last resort. First should be ascertained what more can be done in design, installation or inspection to remove the possibilities of leakage. Since multiple installations, which contain the most gas under the highest pressure, are the most hazardous, they need the most study. Possibly methyl chloride could be impregnated with something that would give it a distinctive odor or produce sneezing to serve as a warning of leaks. For this gas is less toxic than others and is dangerous largely because it lacks odor. But if the hazards of methyl chloride cannot be guarded against in any other way, it would be better to abandon its use entirely than to handicap the expansion of electric refrigeration.

# *Barberton Laboratory for High-Voltage Tests*



THIS outdoor laboratory of the Ohio Brass Company at Barberton appeals to the operating engineer who wants high-tension tests made under field conditions and still it has the flexibility and opportunity for precision measurements afforded indoors. Here the clearances are limited only by man-made structures. Towers and pole construction typical of different practices throughout the country are mounted on portable foundations so they may be compared with each other using different insulator assemblies.

Potentials up to 3,000,000 volts (impact or operating frequency) can be applied anywhere on each side of the cage conductor extending down the center of the field and can be measured by a variety of portable sphere gaps. Even the 10,000-kva./1,200 kv. oscillator is portable. Records of voltage conditions and discharges can be made on Dufour oscillographs and klydonographs adjacent to the field. A camera synchronized with the test-voltage source permits photographs of discharges in the daylight.



# Mine Hoists in New York

Water supply requires large mine equipment. Features of the project and electrical equipment

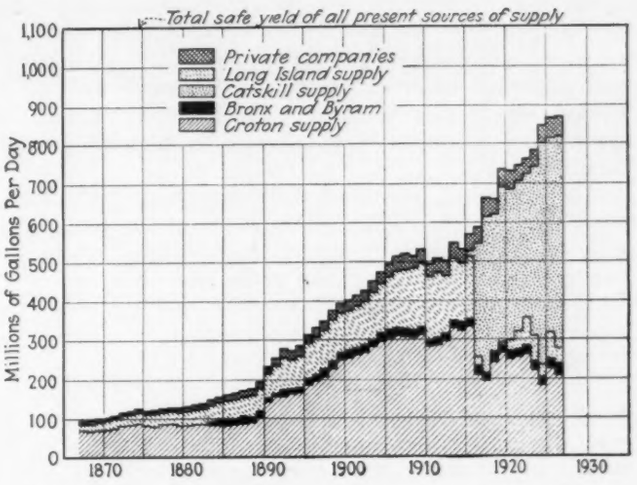
By R. H. Rogers

*Industrial Engineering Department, General Electric Company*

SIXTEEN electric mine hoists and 62 mine locomotives will be put into operation in New York City this fall in the construction of city tunnel No. 2 for the Board of Water Supply. These mine hoists and locomotives will form the major part of the electric motor-driven machinery that the contractor will use on this tunnel contract, which involved the world's record contract award of $42,692,567.50.

The Board of Water Supply, in providing an adequate supply of good water for New York City, is faced by many complex and pressing problems. The city's demand for water increases 85,000 gal. per day, so that it is apparent that the present consumption of 875,000,000 gal. per day will be increased by 1935 to the total safe yield of the developed watershed. The present distribution system is fully loaded, hence the board planned a new pressure tunnel to provide for the distribution of additional water when it becomes available, to relieve tunnel No. 1 of a part of its load and more nearly to equalize water pressures in various parts of the city.

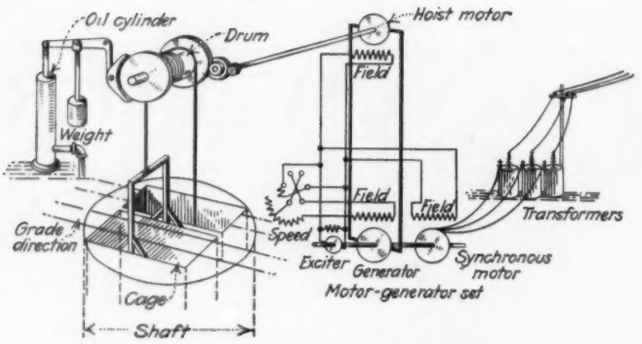
The present distribution system is fed 30 per cent by the eight 48-in. cast-iron mains from the Croton system and 70 per cent by the first deep-pressure tunnel which carries Catskill water. This tunnel, which is 14 ft. in diameter in the largest part, was calculated for 500,000,000 gal. per day and is now carrying 615,000,000 gal. per day. It starts from Hill View equalizing reservoir in Yonkers and runs down the west side of Manhattan Island, thence under the East River to Brooklyn. The area of major population is about 6 miles wide and the water mains extending easterly are very long and as a consequence the pressure is low toward the ends.




*Daily Consumption of Water in New York City from 1868 to 1927, Inclusive*

The new deep-pressure tunnel will extend from Hill View reservoir east through the Bronx, then south under East River through Queens to Brooklyn, ending at Hamilton Avenue opposite Governors Island. It will be 20.2 miles long, 17 ft. finished diameter and it will be about 500 ft. below sea level. There are to be sixteen shafts from 14 ft. to 22 ft. in diameter extending from the surface down to the tunnel and their depths will be from 500 to 850 ft., according to the land elevations. After completion of the tunnel the shafts, with the exception

*New Water Supply Tunnel for New York City*



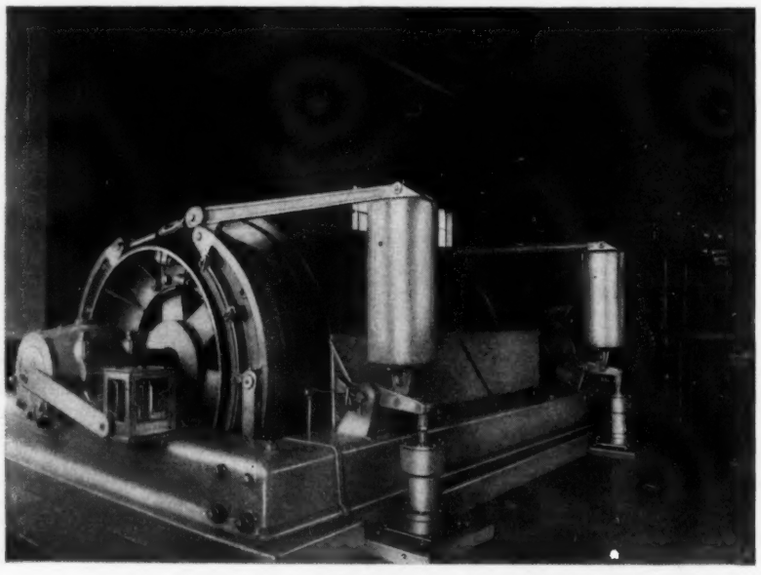

*Schematic Arrangement of Mine Hoist for Water Supply Tunnel*

of the downtake at Hill View, will be risers to valve chambers, from which the street mains will be supplied. The tunnel and shafts, aggregating 22 miles linear measurement, will be excavated to 19 ft. diameter, which will involve the blasting and removal of almost 4,000,000 cu.yd. of hard rock. Lining the tunnel to 17 ft. diameter and incidental construction work will require the placing of 664,000 cu.yd. of concrete. This major work, together with some 65 minor items, is to be completed in 70 months.

The depth of the operations and the quantities of materials to be handled put this work in the mining class and led to the adoption of mine hoists as the central figure at each shaft. Air for drills and shovels will be furnished by 24 400-hp. synchronous motor-driven compressors. The muck will be hauled to the hoists by storage battery mine locomotives. Provision will be made, with 19 100-hp. motor-driven centrifugal pumps, to handle seepage water in any quantity likely to be met with during construction, though it is believed that the tunnel will be fairly dry. The tunnel sections and shafts will be ventilated by 50-hp. motor-driven blowers. The principal function will be to remove dust and gases after blasting.

Each mine hoist will handle two cages "in balance"; that is, one will be coming up as the other is going down. Two rectangular platform cages will be used in the circular shafts. The extra space will be used for water pipes, air pipes, electric cables, etc. The single drum hoist, weighing 30 tons, will be mounted in a head frame, well above the ground level. The 1¼-in. ropes will wind on the drum from opposite sides so that they will each fleet to the center of the shaftway when the attached cage is at the top. The data from which the load diagram and consequently the motor and its complement were calculated are as follows:

| | |
|---|---|
| Type of hoist | Balanced, vertical |
| Distance hoisted, feet | 500 to 850 |
| Rope speed, feet per minute | 500 |
| Type of drum | Cylindrical |
| Weight of cars, pounds | 5,200 |
| Diameter of ropes, inches | 1¼ |
| Weight of material per car, pounds | 10,000 |
| Number of cars hoisted per trip | 1 |
| Weight of cages, pounds | 13,500 |
| Time for acceleration, seconds | 10 |
| Time for retardation, seconds | 10 |
| Rest period between trips, seconds | 30 |

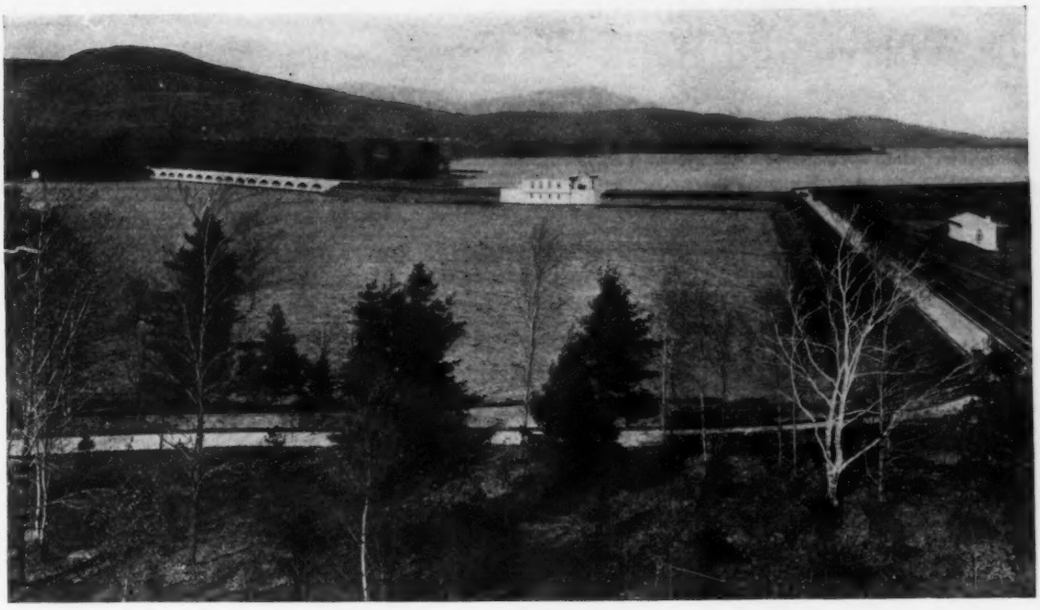


*A Mine Hoist Drum Driven by a 600-Hp., 4,600-Volt Induction Motor*

## Description of Hoists

The hoist drums will be approximately 7 ft. in diameter and will revolve at 22 r.p.m. They will be driven through double reduction herringbone gears and flexible coupling. The brakes of the post type are to be gravity set and oil pressure released, the pressure being supplied by a motor-driven pump. The hoists are being built by the Nordberg Manufacturing Company at Milwaukee, Wis. The hoist motors, motor-generator sets and control have been ordered from the General Electric Company. The motors are rated 250 hp., 500 r.p.m. at 250 volts. They are shunt-wound, direct-current motors separately excited for variable generator voltage (Ward Leonard) control. Each hoist motor will require a motor-generator set, which will consist of the following units: A 350-hp. synchronous motor, 1,200 r.p.m., 2,300 volts for nine sets and 4,100 volts for seven sets; a generator rated 200 kw., 1,200 r.p.m., 250 volts, shunt wound, separately excited; an 8-kw., 125-volt exciter for exciting the fields of the hoist motor, synchronous motor and direct-current generator.

A mine hoist operated on the generator voltage control principle has its speed and direction of rotation controlled by varying and reversing the small current of the separately excited generator field. This could be done for small equipment by a simple rheostat and a reversing switch, but for heavy hoist work the field is varied by cutting in and out blocks of field resistance by means of contactors and the reversals of polarity are brought about by reversing contactors. The operator handles the hoist by means of a master switch similar to those used on elevators. He has six speed points in either direction, but he cannot hurry the acceleration beyond a predetermined rate because the contactors act in regular sequence and with a definite time interval between. However, the action can be delayed in that a whole trip can be at creeping speed. When the master switch handle is moved to either first point the contactors energize the field of the generator in the proper polarity for moving the hoist in the intended direction. Successive points serve to cut blocks of resistance out of the separately



*Typical Water Supply Reservoir for New York City*

excited generator field circuit, causing the generation of higher voltage, which causes higher hoist speed. The operation is semi-automatic in that the braking is automatic and the master switch simply determines when and in which direction the hoist will run. Braking is accomplished by limit switches which are mechanically actuated in sequence as the upcoming cage nears the end of its travel. They serve to operate the contactors to weaken and finally cut off the generator field, to apply the brake on the hoist drum by tripping, electrically, the oil pressure that is holding the brake in release. When lowering an overhauling load, the hoist motor acts as a generator, thus introducing regenerative braking, since energy is returned to the line by the synchronous motor, which for the time being acts as a generator by being driven by the generator which is motoring. The speed of lowering an overhauling load is fixed by the position of the master switch handle.

In actual operation each up-cage will come to a stop about a foot above the ground landing. The operator will swing supporting "chairs" into position and step on a floor push button, which will release the brake and lower the cage onto the chairs at grade. In starting a down trip the cage will first be raised to clear the chairs by pulling the control handle on the first up point for that cage. The chairs will be swung into clear and then the switch handle will be moved to the sixth point lowering.

A valuable feature of direct-current motor operation with generator voltage control is the fact that given positions of the switch handle always result in practically the same corresponding speeds, whether hoisting any amount of load by motoring or lowering any amount of load that overhauls so as to cause generating. This characteristic makes practical under all conditions the practice of stopping by automatic means.

### Storage Battery Locomotives Used

Haulage in the tunnel will be accomplished by 62 7-ton storage battery locomotives. They are to be furnished by the General Electric Company and will correspond in general to the types furnished for the Cascade, Moffatt, Hetch-Hetchy, Shandakin and Cold Brook-Wachusett tunnels. A special feature of the design of these locomotives for tunnel No. 2 is the short length, which allows them to be handled in the hoist cages without dismantling or slinging. They will be 36-in. gage, 44-in. wheelbase, 50 in. high, 52 in. wide and 9 ft. long. Each will be equipped with two 12-hp., 85-volt motors so rated for one hour with 75 deg. C. rise. The drawbar pull is designated as 2,000 lb. at 3½ m.p.h. They will each be equipped with 42 MVA-29 Exide batteries. In general, it is intended to charge the batteries at the surface, hence the locomotives will be hoisted and lowered for that purpose by the mine hoists. Upon these locomotives and mine hoists there devolves the work of taking out 9,000,000 tons of rock and taking in concrete that will require 1,500,000 bbl. of cement in the mixing.

Power will be purchased from six public service companies at three phase, 60 cycles, but at various voltages. Where 4,000 or 2,300 volts is directly available the larger motors will use it without transformation. Transformers will be used in all cases for the smaller motors and for lighting.

For the next six years there will be mining operations going on in mineless New York that would be a credit to Pennsylvania, Arizona or Montana.

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## Consumption of Energy in Belgium

LAST year the per capita consumption of energy in Belgium reached 320 kw.-hr., this figure comparing very favorably with Germany, 250 kw.-hr.; France, 248 kw.-hr.; England, 200 kw.-hr.; Italy, 197 kw.-hr., and Holland, 134 kw.-hr., Switzerland leading in Europe with 700 kw.-hr.

Of the 2,670 Belgian communities 2,010 are now connected to the mains of the central stations, and when the remaining 660 small communities, with an average population of 1,000 each, will also have been connected the whole of the country will be electrified.

Twenty-three central stations, serving about 75 per cent of the country, have an average generating capacity of 32,000 kw., as against 5,000 kw. in 1910. Total amount of energy generated last year exceeded 3,000,000,000 kw.-hr., 90 per cent of the energy being for industrial purposes, 9 per cent for domestic purposes and 1 per cent for public lighting.

# Line-Start Motors Require Wider Pulleys and Belts

By J. R. Hopkins
*Chicago Belting Company*

OWING to the relative newness of that type of motor which takes the current direct from the line without compensators neither the motor manufacturer nor the plant user has given general recognition to the need for wider belts with these motors. However, that seems but a temporary condition and before long we look to see a wide acceptance of the need for wider leather belts on all line-start motors and an increasing number of these motors equipped for belt drives.

Line-start motors or across-the-line motors are those made in such a way that they start across the line in keeping with the rulings of the National Electric Light Association. Standard motors operate with a compensator which regulates the tap of the current, usually 75 to 85 per cent, and with these motors it is very easy for the operator to control the load on the belt when starting.

With line-start motors the current goes directly to the motor and the inrush of the current is controlled by the design of the motor. The operator cannot control the load on the belt during the starting. The motors come from rest to full load quickly and have a high starting torque. As compared to standard motors, the line-start motors have much higher starting torques and higher overloads at the shaft.

It is estimated that about 15 per cent of all new motors are line-start motors today, and there are various estimates as to how extensively they will be used in the future. Five years from now 70 per cent of all new motors will probably be line-start motors. The chief designing engineer of a large electric motor manufacturing company says that he can see no good reason why line-start motors should not supplant all standard motors over 5 hp. and up to 30 hp.

This extensive and growing use emphasizes anything we may say about them, as they are apparently the motor of the future, and the power companies, the electric motor manufacturers and the users indorse them.

## Types of Line-Start Motors

All the leading motor manufacturers are making line-start motors, which come in two different types, normal load line-start motors and high-torque line-start motors. Both have a high starting overload, though the high-torque motor has a higher starting load than the normal load motor. In spite of this higher starting load virtually all of these manufacturers are selling their line-start motors of both types with the same pulley widths as for standard motors. One reason for this is that pulley sizes for motors are specified by the National Electrical Manufacturers' Association, which so far has not taken up the matter of pulleys on line-start motors. We have called its attention to this and no doubt some action will be taken soon.

Motor manufacturers have apparently been engrossed with the purely electrical problems attendant on building successful line-start motors. In this they have done a wonderful job and have been very successful, but they have underestimated the effect of the starting load on the belt. The Westinghouse company has put out one model that has a 50 per cent wider pulley and it has the entire question under advisement at this time.

But most line-start motors are now being delivered with the same width pulleys as for standard motors. When you question the motor manufacturers on this score they will tell you that the effect of the higher starting loads is but momentary and not enough to affect the belt. But belt men all know what happens when you ask a leather belt repeatedly to carry a 200 per cent to 300 per cent overload.

## When the Pulleys Are Too Narrow

In actual shop practice it was found that when the line-start motors were started up the pulley would spin around inside the belt and instead of this being but a momentary spinning, of just a second or two duration, very frequently the pulley would spin around for from 30 seconds to three minutes. Spin a pulley inside a belt that long and you either drive the belt off the pulleys, so that you have to stop the motor to put the belt back again, or you burn the belt.

This trouble is not confined to belts alone. The higher starting loads of these line-starts have also stripped the teeth out of chain drives. When you have a motor equipped with a chain drive and change it to a line-start motor of the same size and the new motor rips the teeth out of the chain belt, which was working all right with the old motor, you can feel sure that the new motor has a starting load that the old motor never had.

Of course the length of time the pulley will spin inside of the belt when the motor is starting up depends on the load. Some loads are much harder to start with than other loads. In each case the motor always has the same overload in starting, but the amount of the load determines the length of time this overload will be felt by the belt.

At a meeting of electrical maintenance engineers in Chicago, attended by about 140 maintenance engineers of the largest plants in Chicago, it was agreed that wider pulleys and belts were needed and that this starting of line-start motors without widening the belt has given a great deal of trouble.

Just as soon as the motor manufacturers understand the user's experiences a little better no doubt they will put on wider pulleys. This subject has been brought to the attention of every one of them and it is to be expected that they will all be using the wider pulleys very shortly.

This starting trouble does not only concern itself with the belt, it also means increased maintenance costs and decreased productive time, both very important. Normal load line-start motors have less starting torque than high-torque motors, but even normal load line-start motors require wider pulleys and wider belts. A standard motor has an overload in starting of 112 per cent at the shaft. A normal load line-start motor has an overload in starting of 150 per cent at the shaft.

Normal load line-start motors require a pulley and belt from 20 to 25 per cent wider than you would use with a standard motor. If the belt used with a standard motor were 4 in., you would require a 5-in. belt on the line-start motor of the same horsepower. This applies to all of these motors 7½ hp. and over.

High-torque line-start motors should be ordered with pulleys 50 per cent wider than for standard motors of the same rating on all motors 10 hp. and over. On these motors the maximum torque in starting ranges between 2.38 times full load and three times full load. This necessitates a pulley and a belt 50 per cent wider. Sometimes the starting load indicates that a belt a little less

or a little more than 50 per cent wider is needed, but to consider that the belt should be 50 per cent wider for all high-torque line-start motors seems sound enough.

Unless the user of the motor who is ordering new line-start motors specifies that the pulleys must be wider, specifying how much wider they should be, he will not get them and will have trouble. Most plants have some line-start motors now. All they have to do to check this up is to watch the pulleys spin inside of the belts when the motor starts up.

Where there are existing line-start motors now giving trouble the operator should see if he can put on a heavier belt and increase the speed by increasing the diameter of the pulley. If that does not work he can try increasing the diameter and also increasing the pulley width about 20 per cent.

Line-start motors cost less than standard motors. Whether this increase in width of pulley and belt will change this very much I do not know, but we estimate that even with the wider pulley and wider belt the line-start motors will still be cheaper than standard motors. They also have the advantage of decreasing maintenance costs considerably and eliminating a lot of trouble.

This not only means wider belts for motor drives but also that the high starting torques are such that care must be taken not to transmit shocks to the driven machines. With some machines this would be very harmful. All of which indicates that a number of motors now direct connected or equipped with chains will be better off with belt drives when the motors are changed to line-start motors. It also means that a number of plant men will be having or are now having belt trouble, by their motor belts burning or having them wear out quickly. And they may ask you what's the matter with the belt on these drives. They will lose sight of the fact that they have a new motor of a different type and expect the same belt life from the belts on the line-start motors that they received on the standard motor. And they won't get it.

When you have belt trouble from burning or where there is a complaint about the shortened life of the belt, check up the motor. If it is a line-start motor pay attention to the higher starting loads and the need for wider belts.

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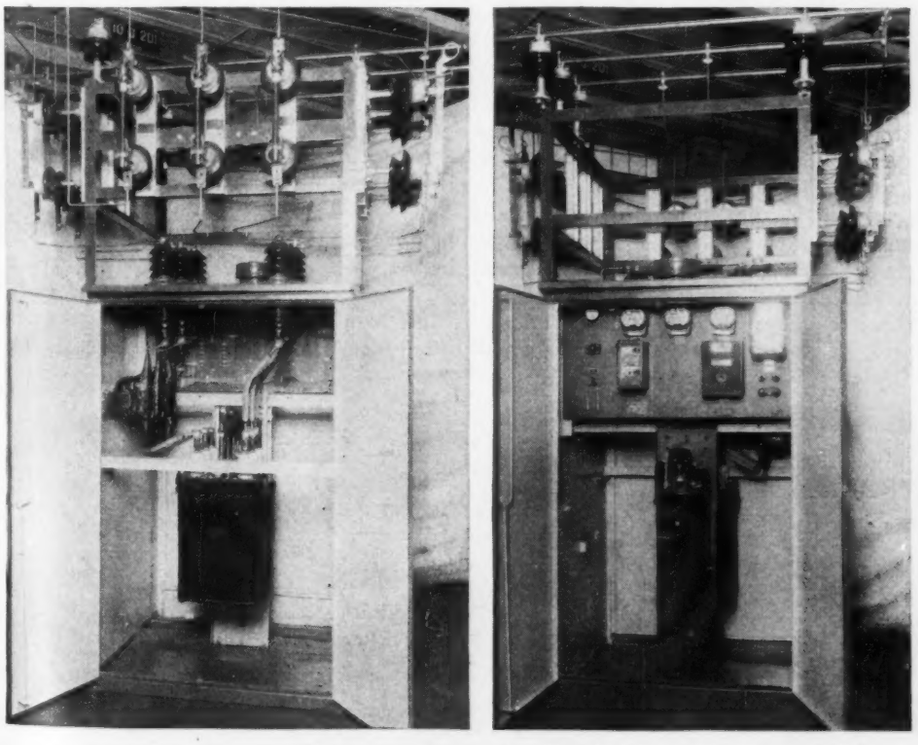
# Automatic Switching Unit Cuts Rural Costs

By J. H. Powers
*Switchgear Department, General Electric Company*

THE increasing demand upon operating companies to supply power in sparsely settled districts requires that the cost of the switching equipment installed shall be reduced in so far as good engineering practices permit. Manufacturers are endeavoring to meet such demands in an efficient and satisfactory way.

A number of outdoor switch houses, each with a structure on the top for disconnecting switches, fuses and supports for busbars, have recently been provided for several Pennsylvania properties of the Metropolitan Edison Company. Three disconnecting switches are mounted on each side of the superstructure and are used to disconnect the roof bushings from the incoming and outgoing lines. Three combination disconnecting switches and fusible cutouts are mounted on the rear of the superstructure to short circuit the switch house while the isolating disconnecting switches are open. If fuse protection is not desired on the feeders, then ordinary disconnecting switches may be substituted.

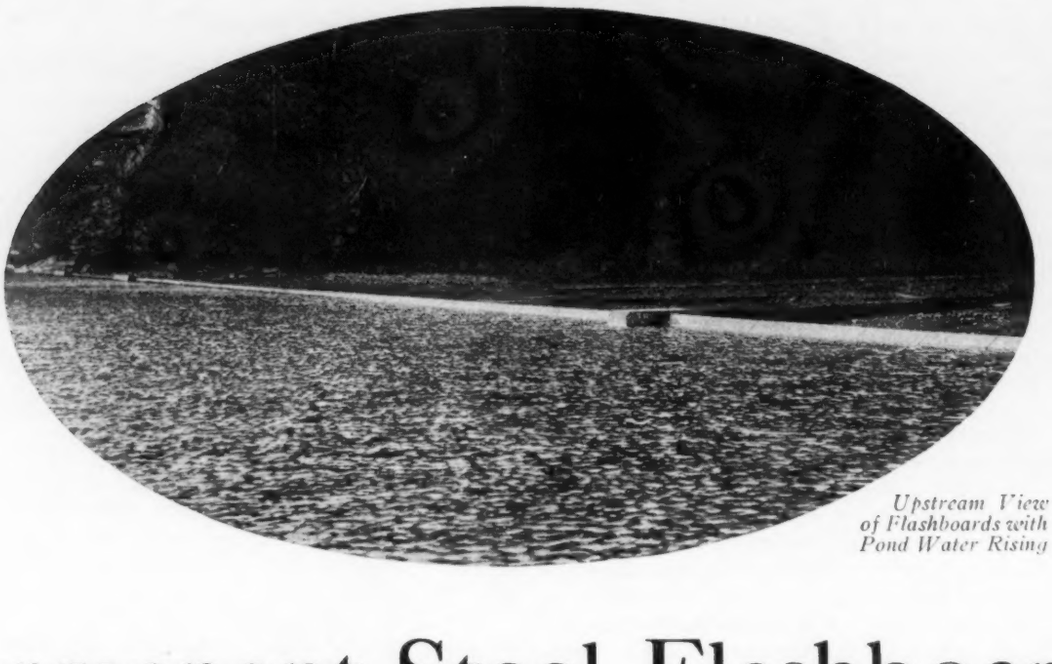


*Superstructure on Breaker Housing Offers Switching Unit for Economical Rural Service*

Folding doors on two sides lend easy access to all instruments and equipment

This equipment eliminates elaborate and costly substation structural framework and permits the inspection of the switch house equipment without interrupting service on the feeders. The installation cost is also minimized as switch houses with superstructures are shipped intact with all equipment assembled and ready for service. The superstructure idea may be modified to suit almost any condition which may arise. One arrangement provides switches on the front and rear to allow placing two or more switch houses adjacent to each other. If uninterrupted service is not required while isolating the switch house equipment, then it is only necessary for the design of superstructure to provide for one set of disconnecting switches in the incoming line.

The Metropolitan Edison Company is installing houses of this design at its Palmyra, Gettysburg, York Haven, Bangor, Myerstown, Windgap and Montrose properties.



*Upstream View of Flashboards with Pond Water Rising*

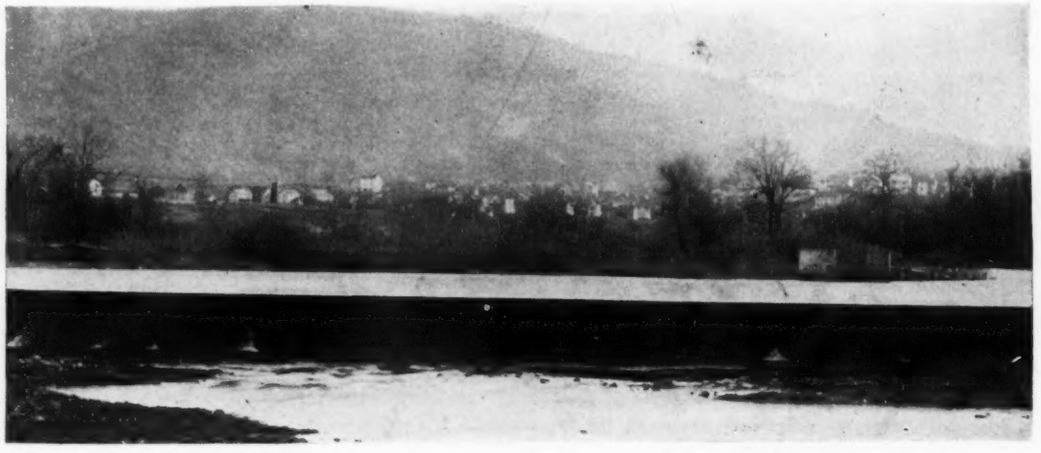
# Permanent Steel Flashboards

**Installation at Saxton, Pa., has unusual features. Unaffected by cold weather. Description of installation of steam plant circulating water control**

By HENRY W. TAYLOR
*Consulting Engineer, New York, N. Y.*

THE Penn Central Light & Power Company constructed, in 1922, a steam generating station at Saxton, Pa., about 1,000 ft. east of the Raystown branch of the Juniata River. An additional unit was installed in 1926, bringing the total capacity to 55,000 kw., and since the permanent diverting dam was not built in 1922 and a temporary rockfill dam was leaking, a concrete dam with flashboards was constructed in connection with the plant addition. The purpose of the dam was not only to flood the intake of the conduit leading to the condenser pumps but to provide an hourly storage during summer months to accommodate peak-load demands during the day.

Due to existing furnace pits along the shores of the Raystown branch of the Juniata River, the design of a diverting dam across the river included permanent flashboards under remote control, which would maintain a limited backwater during low-flow conditions of the



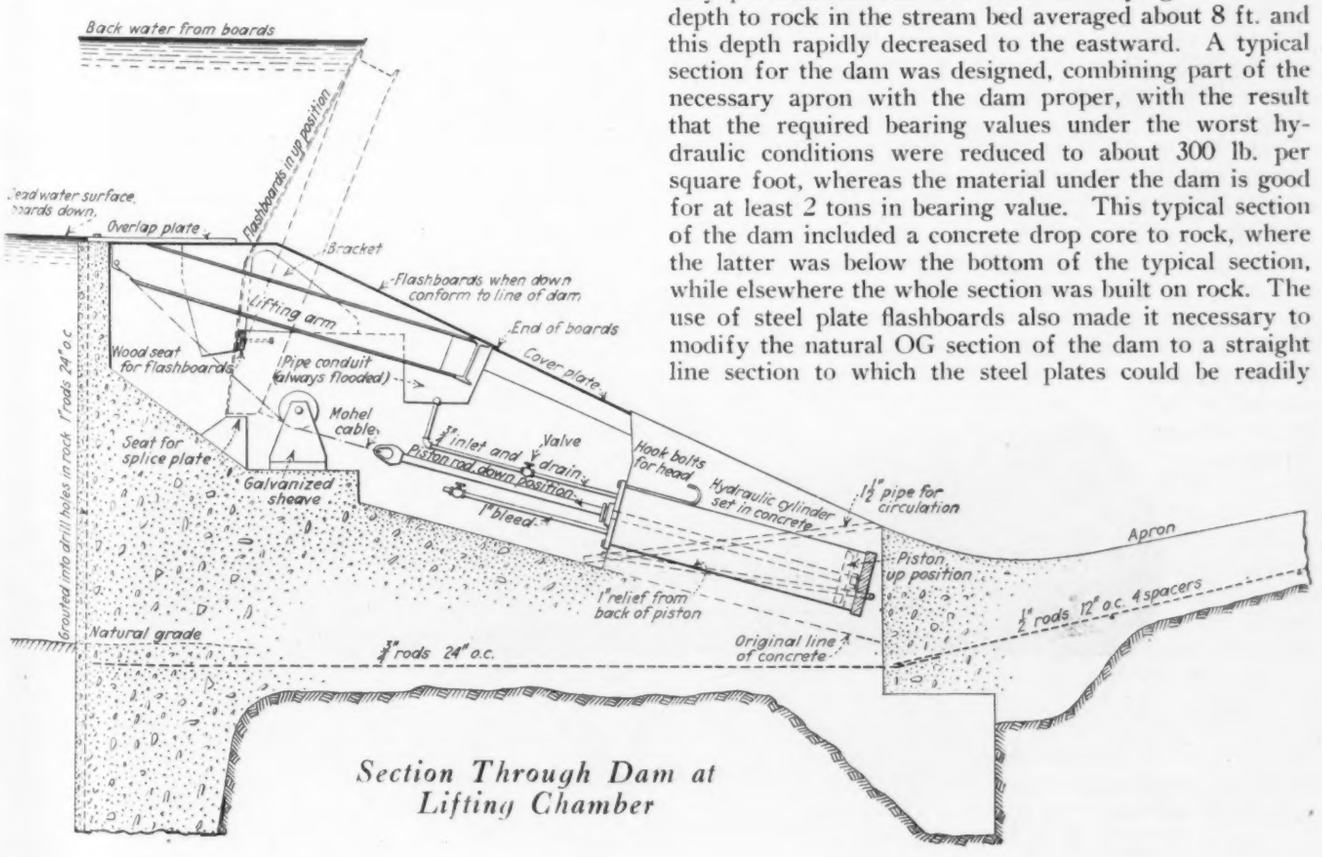
*Easterly End of Flashboards from Down Stream*

*Heavy River Flow with Western Section (250 Ft.) Down and Other Sections Up*

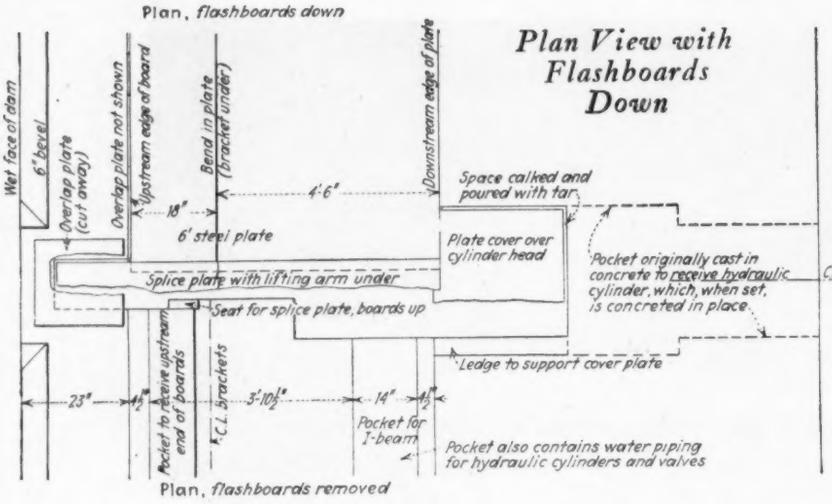
stream and afford a free flow during periods of high water. As this river has several periods of flash flow during the normal year, replacement of temporary flashboards involved an undesirable amount of both time and money. The time element might easily cripple the plant, as these flash flows subside almost as quickly as they develop, while the cost of frequent replacement of boards would more than pay the interest on a permanent installation. It was also considered that engine room control would prevent any liability of damage suits as well as materially assist in the best plant operation. Remote control at the power house was a third element in the case that demanded consideration.

The elevation of the crest of the dam was limited by rights above the dam, but an adjustment was made along the following lines. During low-water conditions the dam and flashboards could maintain, without damage, a backwater extending upstream about 1½ miles and a storage at the plant intake that could be used during peak loads and properly flood the mouth of the intake. In case of increased flow one or more sections of the boards could be lowered to accommodate this increased flow and still maintain a normal backwater without damage to upper properties. In case of heavy flows, and with the flashboards all down, the height of the dam was such as not to affect the hydraulic conditions at the upper properties, since the local hydraulic situation governed at such flows. The original plans for the dam, which were drawn in 1922, were redesigned to effect material economies and to permit of this flashboard construction, which is integral with the concrete structure.

The river bed at the site of the dam consisted of boulders, gravel and sand, all of which provided suitable bearing values for a low diverting dam, but presented a very pervious stratum above the underlying rock. The depth to rock in the stream bed averaged about 8 ft. and this depth rapidly decreased to the eastward. A typical section for the dam was designed, combining part of the necessary apron with the dam proper, with the result that the required bearing values under the worst hydraulic conditions were reduced to about 300 lb. per square foot, whereas the material under the dam is good for at least 2 tons in bearing value. This typical section of the dam included a concrete drop core to rock, where the latter was below the bottom of the typical section, while elsewhere the whole section was built on rock. The use of steel plate flashboards also made it necessary to modify the natural OG section of the dam to a straight line section to which the steel plates could be readily




*Section Through Dam at Lifting Chamber*


Plan, flashboards down
Plan View with Flashboards Down
Wet face of dam
6" bevel
Overlap plate (cut away)
Overlap plate not shown
Upstream edge of board
Bend in plate (bracket under)
Downstream edge of plate
Space calked and poured with tar
Concrete apron
4'-6"
18"
6' steel plate
Plate cover over cylinder head
Pocket originally cast in concrete to receive hydraulic cylinder, which, when set, is concreted in place
C.L. blocks of dam (20' o.c.)
Splice plate with lifting arm under
Seat for splice plate, boards up
Ledge to support cover plate
23"
4½"
Pocket to receive upstream end of boards
C.L. brackets
3'-10½"
14"
4½"
Pocket for I-beam
Pocket also contains water piping for hydraulic cylinders and valves
Plan, flashboards removed

adapted. The use of permanent boards also required pockets and special molding of the concrete section underneath the boards to allow for brackets, hydraulic chambers, etc. The slopes of the straight line overflow were reduced to about 27 deg., so that screeding would be possible with a dry mix and down-stream forms would not be necessary.

### Details of Flashboards

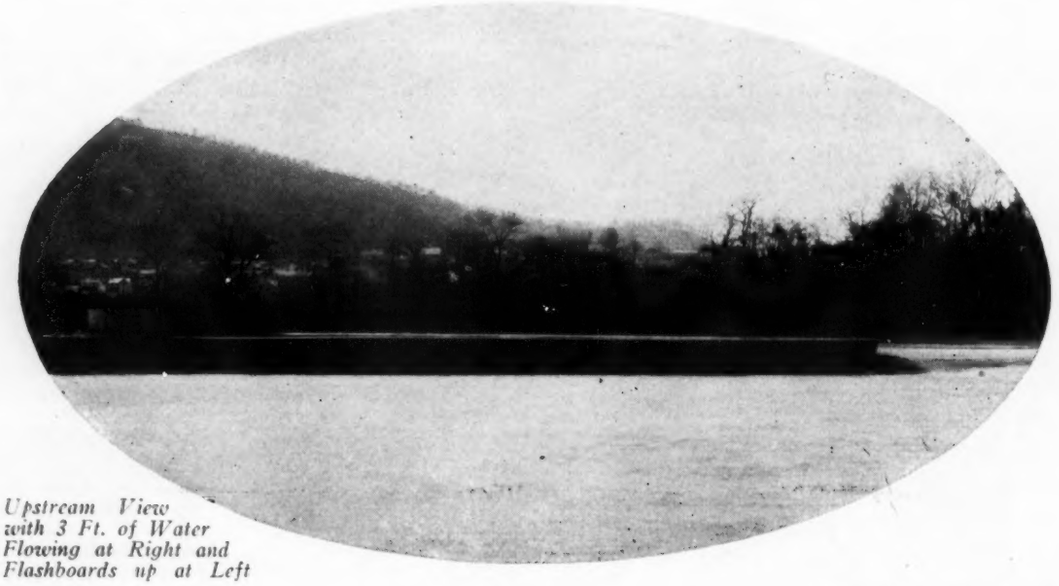
The flashboards were built in 20-ft. sections, consisting of two plates 6 ft. x 10 ft., spliced with overlapping plate with continuous welding. These plate sections were reinforced with bent angles perpendicular to their long axis, an angle along the lower edge and an I-beam at the down-stream edge. The angles were for reinforcement only, while the I-beam acts as a cantilever on both sides of a lifting member in the middle of the section. The various sections of the boards, which represent a total length of 600 ft., were spliced together in the field with double splice plates. The holes in the flashboard plates were made oblong to allow for flexibility and a curved outline during the process of raising or lowering.

The boards are supported and hinged on small brackets or welded shapes and plates. A central heavy bracket supported the lever arm, which is attached to the lifting cylinder by a monel cable. The lighting cylinders were constructed of seamless rolled brass tubing and are single acting, with cast-iron pistons and single cup leathers, steel piston rods, with tobin bronze sleeves. The cable passes through a galvanized steel sheave in the alignment of the piston travel. To raise the boards, water pressure is applied to the cylinders and the cables raise and maintain the boards in position. With released cylinder pressure, the water pressure against the boards lowers the boards to their down position, which conforms to the shape of the concrete dam and covers all operating parts of the construction.

The hydraulic cylinders were installed in the concrete chambers with heads free, and head bolts being hook bolts imbedded in the concrete. Anchor bolts for all parts of the construction were installed from template forms when the concrete was run, each bolt being installed in a sleeve to permit of minor adjustment.

The boards were grouped together in three sections, one of which was only 100 ft. long and of a reduced height. The two other sections consisted of about 250 ft. of flashboards each. The long sections rise in a sinuous curve on the upper edge, until one point strikes the bottom seat of the boards, and this curve then straightens out to give normal alignment.

Water piping, connected to the individual cylinders, grouped in three sections and extended to the power house and valves, mounted on a small panel, controls the operation of the boards. Closing the drain valve and opening the pressure valve provides the required pressure to the hydraulic cylinders and the section is lifted by the cable on the cylinder piston. This lifting of the board section could be accomplished in less than one minute, if desired, but the boards are usually raised slowly and in a period of about two minutes. It will be noted that the drop section of the flashboards hangs below the axis of the brackets when the boards are in the up position and acts as resistance against dropping. Until the water behind the dam is at the lip of the flashboards, when up,



*Upstream View with 3 Ft. of Water Flowing at Right and Flashboards up at Left*

the water pressure on cylinders can be relieved, and the boards will remain in the upright position, although a little leakage around the ends of the sections and at the bottom will result. The forces maintaining the boards in position are a combination of the reaction due to the drop section of the board and the static resistance to movement in the brackets, cylinders and at the seats. When the water level in the pond reaches the top of the board, release of the water pressure to the cylinders and opening of the drain valve drops the board as quickly as may be desired. The water from the pond then flows over the plates as smoothly as if they were an integral part of a typical overflow section of spillway, and all parts of the mechanism are covered by the boards.

The conduit or pocket in the concrete that provides room from the end I-beam of the flashboards and a runway for the control piping is supplied with water at will by a shear gate that takes water from the pond. Bleeds in the control piping provide for a circulation of water and there results an external submergence and circulation and an internal circulation. Cold weather does not, therefore, interfere with the operation of the boards.

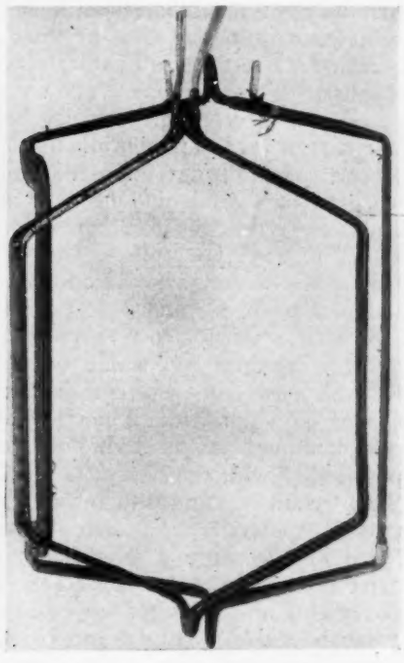
In the river section of the dam two hydraulic drain gate chambers were installed, which include four 36-in. drain gates, also controlled from the power house. These gates will release about 500 sec.-ft. and are operated as the first stage of relief in case of an increased flow. If this relief is insufficient, the 100-ft. section of flashboards (which are only 2 ft. high) can then be lowered. The 250-ft. section of board in the river proper would next be lowered, and if the river still continued to rise the last section would be lowered. As the river flow subsides the two 250-ft. sections would be raised again in order, etc. One of the drain valves is supplied with a pipe extension from the dam to the location of the mouth of the intake to the condenser pumps and will be used as a sand ejector.

# New Apparatus for Old

## Rebuilding with modern parts may effect economies where total replacement cannot be justified

By A. C. Roe
*Renewal Parts Engineering Department, Westinghouse Electric & Manufacturing Company*

GENERATING plants installed prior to 1910 are approaching the stage where replacement or rebuilding is necessary. But the money required for replacement is not always available, and future plans sometimes make the spending of a large sum inadvisable. Consequently tthe possibility of repairing or rebuilding units and incorporating modern features deserves more attention than is sometimes given. Rebuilding of a generating unit can be extended to cover the prime mover, the switchboard, control apparatus, etc., but in the generator windings is where the biggest improvements and savings can be had. The question is, what modern improvements can be incorporated in the rebuilding, what is the cost and what final results can be expected?



*An Expensive Winding to Duplicate and a Two-Layer, Diamond, Pulled Coil, Which Saves Copper Loss*

Left, old-coil-per-slot winding using the involute type of coil ends, requiring special tools to make, and, right, economy is effected over one-coil-per-slot, diamond-end winding, dropped-bottom cell type of coil because of reduction in total length of conductor.

In most cases improved operation and quite often an increase in rating can be obtained. The last advantage is evident only when we consider the old windings, such as the concentric chain type of open-slot, or shoved-through design, or one-coil-per-slot, two-layer, diamond-end winding with dropped-bottom cell or the one-coil-per-slot, involute, end winding and other types.

The cost of rebuilding can be minimized by replacing such windings with the modern two-layer, two-coil-per-slot, diamond, pulled type of coil, which eliminates costly molds, formers, benders, etc., with their attendant high cost of fabricating.

The cost can also be held down in some cases, when

the field coils in a machine have been damaged, by replacing the edge-wound strap-copper field coils on alternating current generators, by coils wound with double cotton-covered square or ribbon wire which have been given special treatment during and after winding to solidify them.

Improved operation can be expected when the end windings are shortened due to the use of a diamond type of coil, with chorded pitch, as the inductive effect is reduced, wave form improved and the heat distribution improved by breaking up the concentrated coil.

Increased rating can be expected when the total weight of copper is reduced and the cross-sectional area increased as changing from a round to a square wire of the same diameter. The reduced weight is accomplished by reducing the length of the mean turn per coil.

Additional rating can also be obtained to a limited extent by changing from class A to full class B insulation, permitted in one case by changing to a coil that was adaptable to the use of mica tape on the conductors and asbestos finishing tape. The copper losses were also reduced and the combined change resulted in a 100-hp. motor carrying 130 hp. continuously.

In one case an order for a few coils revealed that the price of a part set would be high and that a complete set of new type coils could be built for less than the part set of old type coils. This information was referred to the owner, who placed his order for a complete set of new type coils and 2 tons of new core iron. As a result what started out as a patch job turned into an order for material completely to rewind and restack a core with new iron replacing burnt spots. The total cost was on a par with, if not less than, the patch job, and a continued yearly saving will ensue due to lower copper losses with the new type coils.

Thus rebuilding and utilizing all the engineering skill, improved materials and manufacturing methods developed by the original manufacturer result in an improved unit, at a cost considerably lower than that of replacement, and in some cases a contemplated patch job can be made a rebuild proposition at a saving and with greater satisfaction.

# Interlocking Shovel Control for Safety

By M. H. Sheldon
*Industrial Control Engineering Department, General Electric Company*

TO PROTECT the operators of its 4-cu.yd. full-revolving electric shovel, the Chile Exploration Company has had its a.c.-d.c. control inclosed in a steel cabinet with special interlocking features.

The apparatus includes:

An oil-immersed contactor for throwing a 250-hp., 5,000-volt, induction motor on the line. This motor drives the hoist-swing-thrust generators and exciter. The contactor is operated from a start-stop button located convenient to the operator.

Three single-pole contactors; one for exciter emergency trip contactor and two for thrust and swing motor brake circuits.

Three single-pole disconnecting switches for opening incoming power circuit.

Two magnetic switches, one used for dipper trip motor, one for hoist blower motor.

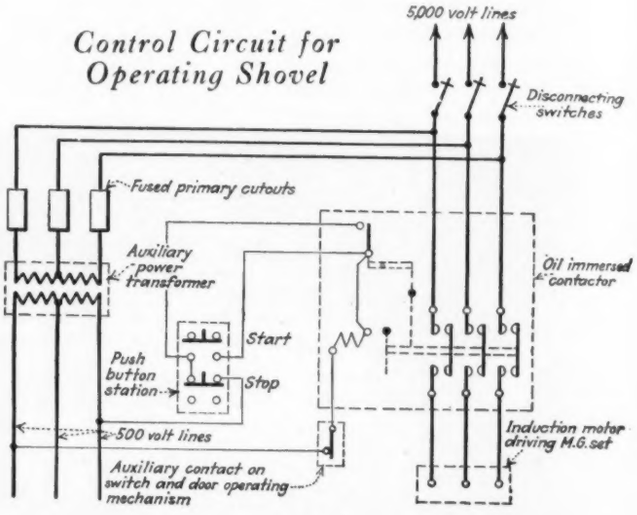
Three primary fused contacts for disconnecting auxiliary power transformer.

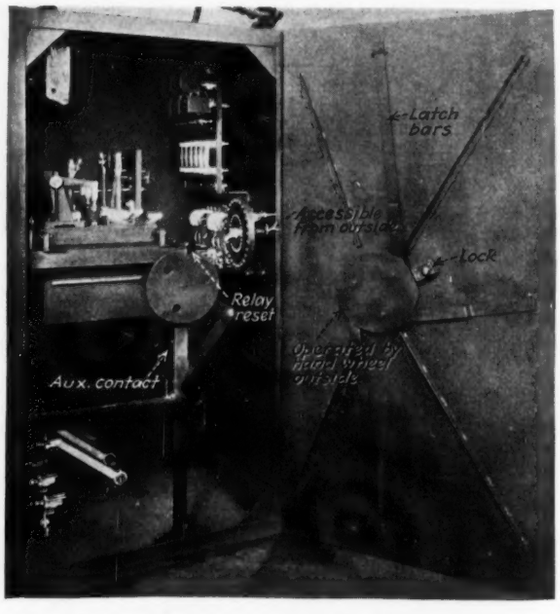
An exciter field rheostat.

A cutout switch for tripping oil-immersed contactor.

Operating mechanism for disconnecting switches.

The interlocking scheme prevents the inclosure door being opened until the power circuit has been opened, thus protecting the operator or repair man against contact with live parts. Assuming the inclosure door is closed and locked and it is desired to get into the inclosure, the operator first unlocks a flush-type lock on the door. This allows the hand-operating wheel to be turned in counterclockwise direction. Turning the handwheel opens the auxiliary contact, trips the oil-immersed contactor (if it already has not been opened by the "stop" button), opens the disconnecting switches and finally




*Interior of Interlocked Shovel Control*

opens the latch bars at the side, top and bottom of the door. At the same time these latch bars are operated, a locking bar engages the clutch of the switch-operating mechanism and locks the disconnecting switches in the "open" position. The door can then be opened. It must be again closed and locked before disconnecting switches and oil-immersed contactor can be closed.

Provision is made for resetting the overload relays on the magnetic switch panels, also for operating the exciter field rheostat from without the inclosure.

# Hash—What Kind Do You Prefer?*

Uncertainty of content places street-lighting rates in same category as boarding house dish. Example given to show incongruous jumble of requirements. A simple form proposed

By W. M. Black
*Electrical Engineer*
*Pennsylvania Public Service Commission*

STREET-LIGHTING rates as they exist are "hash." There is the common or boarding house variety, the more decorative red-flannel hash of New England, as well as the highly cultured, college-educated hash. The offerings are attractively arranged, served cafeteria style, and all produce highway and byway lighting for a price.

In Harrisburg we have more than 3,999, more or less, unique schedules or contracts.

The first one is apparently just plain fried potatoes—not much fat used either. Here's the recipe:

> Incandescent lights, current only—without maintenance—each $2.33⅓ per month.

Prepared by a small company interested in a real estate development, for service in the development, being part of a town of 3,800 population, served by another company.

Next in line, for a small village of 310 people:

> 60 cp. series "Mazda" incandescent lamps, burning each night from dusk to midnight, $16 net per lamp per year.

Brief and to the point, but a lot left to the imagination.

Consider this one, applying in a city of 15,796 and boroughs (towns) of 665, 1,037, 2,366 and 1,196 population, respectively:

> Availability: Public street, highway and roadway lighting service.
>
> Annual charge per lamp for all-night service supplied from *overhead lines.*
>
> | | | |
> |---|---|---|
> | 100 | cp. series incandescent lamps | $25.00 |
> | 250 | cp. series incandescent lamps | 35.00 |
> | 400 | cp. series incandescent lamps | 50.00 |
> | 600 | cp. series incandescent lamps | 60.00 |
>
> Based on spacing distance of 150 ft. between lamps. Where greater than 150 ft. a charge of 30 cents per annum will be added for every additional 10 ft. of spacing.
>
> *Underground Wires.*—Annual charge $5 in addition to overhead rate for each lamp supplied from underground lines plus 15 cents per foot per annum for all conduit required between lamps. Conduit will be listed at the shortest distance along curb lines between lamps to be served.
>
> *Quantity Rates.*—Rates apply to contracts aggregating from $1,000 to $2,000 per annum. Contracts aggregating $500 to $1,000 per annum. These rates to be increased 5 per cent. No contract made less than $500. Contracts over $2,000, rates decreased 5 per cent.
>
> *Terms.*—5 years.
>
> *General Terms and Conditions.*—Lamps, wires, poles and other appurtenances to supply service to be, and remain, property of company.
>
> Special equipment not in general use by company to be paid for by consumer
>
> Where change to type of equipment is desired before same is fully depreciated, a reasonable allowance shall be made to the company, based on 15-year life.
>
> Series incandescent lamps will be of standard lumen ratings of 10 x nominal candle-power.
>
> Operation, dusk to dawn.

A fairly typical schedule, not containing all the possible ingredients, and omitting some that another company or town would consider essential.

At the end of the line we come to an offering served on a well-filled platter—6½ pages long. It looks enough for a big city, but it was prepared for a town having a population of only 6,666. Close examination shows that it is mostly "trimmings." Here are the contents:

> The borough is to buy (including pay for) its lighting for all municipal buildings at 6 cents per kilowatt-hour and also have a street lighting system composed of 174 lamps in four classes from 100 cp. up to 600 cp. rating, and at prices ranging from $26 to $55 per year, under a ten-year contract.
>
> There is a 10 per cent penalty if monthly payment is delayed beyond the fifteenth of the month; increase in annual rate per lamp as remaining years of contract term decrease; limitation of the length of extension per lamp at above rates with a provision for the consumer to pay $20 for every 120 ft. or fraction thereof in excess of the stated distance; a minimum charge of $5,597 per year; and a penalty or rebate clause for protracted outages.

No more meat than the smaller helpings, mostly decorations, sprigs of verbal parsley generously arrayed around the substance in a manner considered delectable by the legal mental appetite.

Out in the kitchen we now hear that expert in street lighting dietetics, John Q. Expediency, as he explains how rates are prepared to satisfy the civic appetite of each community. What's that he said? "It doesn't make any difference in the rate whether the town has a population of 50 or 50,000."

The size of the town only places a limit on the size of the helping. It is, however, necessary to know if the public appetite is good—and no indigestion. Is the town just "rarin'" to get "lit up" or have we a small group of progressive intellectuals trying to force street lighting on the town as a sort of doctor's prescription, because it's good for the community?

What kind of lighting do they have and what do they pay in Nearby-ville? Or has the leading citizen spent a two weeks' vacation in the big city where they only pay so much for such a light? "Certainly a hustling, wide-awake progressive town like ours should be taking the lead among its sister communities."

Of course if the town already has street lights, then the foregoing considerations apply to the artistic boulevard lighting, and then to some more boulevard lighting.

"Keeping up with the Jones'" is a big factor in street lighting and helps the cashier to appraise the probable revenue available to keep the restaurant running.

Catsup or a piquant sauce is always served with, or mixed into, "hash." We get just the right flavor by using extract of the U. S. Mint, combined with other elements in varying amounts, in a manner to tickle the

*Presented before conference of Pennsylvania utility engineers at Washington, D. C.

community palate. Sometimes we can just dump it over the top, but generally it has to be carefully combined with other things, so that the consumer gets just the flavor he wants.

Here are illustrations taken directly from schedules, not as examples of the exact proportions to be used, but simply to show how the quantities of "mint sauce" are varied under different conditions.

Most of the citations will be in the form of comparisons, and where made will, as far as possible, be taken from the same schedule so as to indicate the weight given to the specific conditions cited.

*Type of Circuits.*—One company states rate for series incandescent lamps but with no differential because circuits are operated at 6.6, 7.5, 15 or 20 amp. This same company quotes multiple circuits in comparison with series as follows:

Rate per annum 6.6-amp. series circuits 110-volt multiple circuits:

| | | |
|---|---|---|
| $30.00 | 100 cp. | 100 watts |
| 24.00 | ..... | 60 watts |
| 18.00 | 60 cp. | 40 watts |

Some one else quotes this:

| Rate Per Annum | Arc Lights | Series Incandescent |
|---|---|---|
| $65.70 | 4 amp. | 1000 cp. |
| 73.00 | 6.6 amp. | 1500 cp. |

Still another provides for 6.6-amp. magnetite series arc lamps at $88 per year, as against 1,000 cp. series incandescent lamps at $80 per year and 1,500 cp. rating at $95 per year.

*Type of Lamp.*—"4 amp. series luminous pendent type arc lamps at 15.8 cents per lamp per night." But the ornamental type is quoted at 18 cents per lamp per night, a difference of 2.2 cents per night.

Or this from another schedule:

256-cp. series incandescent lamp $39 per year
250-cp. series incandescent lamp 49 per year
(Using special highway units)

*Type of Supports.*—"For suspension of lights on center of street, an additional charge of $2 per lamp per year" is provided in some schedules, while others state that the lights may be on a bracket or suspension without extra charge. If you want ornamental poles you pay the difference in installation costs generally.

*Spacing of Lamps.*—Spacing of lamps is a big factor in rates, but many rates are based on the system as is, at the time of contract, which, of course, includes the present spacing, and is not stated. The schedule previously quoted as "typical," however, has definite spacing provisions. Rates are "based on spacing distance of 150 ft. between lamps," with a charge of 30 cents per annum added for each 10 ft. of additional spacing.

In another schedule rates are based on "twenty or more 100-watt lamps spaced not to exceed an average of 500 ft. apart." Or a third one, "spacing not more than 450 ft."

The effect of spacing will again appear in the discussion when additional lamps are considered.

*Number of Lamps.*—This is a sequel to spacing. Most companies state rates based on, say, "twenty or more . . . lamps" or "not less than 25." Some, however, have specific rate differentials because of a difference in number. Thus:

| | Ten Lamps or Less | More Than Ten |
|---|---|---|
| Rate per year 60 cp. | $20 | $19 |
| Rate per year 600 cp. | 65 | 60 |

and intermediate sizes in proportion.

One company makes the following reduction in stated rate:

| | Per Cent |
|---|---|
| Over 25 lamps and not over 50 | —2 |
| Over 50 lamps and not over 100 | —3 |
| Over 100 lamps | —5 |

Another method of statement is on the basis of money value, as in the so-called typical rate. Lots of other samples are possible, but they would only serve as cumulative evidence of the principle.

*Minimums.*—Samples of statement of minimums have been given under the heading "Number of Lamps" and elsewhere. Many schedules and contracts failed to state any minimum charge, but I found one schedule that definitely states "Minimum Charge—None." The next lowest one was for $1.75 per month. Stated either as so many lamps or so many dollars, we find the minimum definitely fixed in most cases. Here is an offering, however, from a schedule which makes the rate definitely depend upon the amount of the minimum charge:

Minimum charge—
$540 per year at above rates.
360 per year at increases of 33⅓ per cent of above rates.

Note that the "quantity rates" in the typical schedules, also referred to under preceding heading, operate in the same way but on a variation of only 5 per cent in either direction. Under this form of statement the rates to be paid depend upon the minimum obligation to pay and would not be changed even though lamps were added to the system to an extent sufficient to raise the total required payments above the higher minimum when figured on the lower rates.

In the section of "discounts and penalties" is quoted a so-called "quantities discount," which operates in the same way on a contract for a fixed number of lamps, but this last method apparently gives some proportionate saving as the bill increases because of additional lamps.

*Time of Service.*—Here are the choices, "all-night burning," "twilight to dawn," "one-half hour after sunset to one-half hour before sunrise," "approximately 4,000 hours per year," "3,650 hours per year," "approximately 4,000, but not less than 3,950 hours per annum," "ten hours per night," "twilight to 11 p.m." or "to midnight" and "five hours per night."

Part time service makes a difference in rate. Here is one sample:

| | | |
|---|---|---|
| 400-cp. lamp | dusk to midnight | $35 per annum |
| | dusk to dawn | $52 per annum |

And another:

100-watt lamps $18 per year for five-hour service per night. Same lamp ten-hour service per night carries an annual rate of $25.20.

Consider, also, this comparison:

| Evening Burning Lamps, Candlepower | Annual Rate | All-Night Burning Lamps Candlepower |
|---|---|---|
| *100 | $24.00 | 60 |
| *250 | 30.00 | 80 |
| ..... | 36.00 | 100 |
| *400 | 42.00 | .... |
| *600 | 54.00 | ..... |
| .... | 60.00 | 250 |
| ..... | 78.00 | *400 |
| *1,000 | 90.00 | .... |

*Rates for these lamps subject to a discount of 5 per cent, if paid in ten days; all other rates net.

Listen to this one:

Net rate (Energy only):
0.33⅓ cents per mo. per watt of connected lamps burning until 11 p.m.
0.40 cents per mo. per watt of connected lamps burning until 12 p.m
0.80 cents per mo. per watt of connected lamps burning until dawn

The relative differences do not appear to be relative. Why? Your guess is better than mine, for it's more apt to satisfy you.

*Ownership of System.*—Company ownership, operation and maintenance is the general basis upon which rates are calculated, but the consumer is allowed to have conditions or equipment differing from the company standards, without change of rate, provided consumer pays for "special equipment not in general use by the company."

A few samples of rate changes because of customer ownership or maintenance are in order.

Here is one:

> For lamps placed on the established borough street lighting circuits and the borough furnishes its own poles, lamps and renewals, the rates are:
>
> 60 cp. series incandescent lamp $15 per year
> 100 cp. series incandescent lamp 48 per year

This same company furnished everything in nearby towns for $30 per year for a 60-cp. lamp.

Joint ownership and maintenance are clearly illustrated in this one:

> Equipment and maintenance by the company; ornamental poles and hoods by the consumer; with 250-cp. lamp at $50 per year and 400-cp. quoted at $75. There is also the further provision that, "where customer furnishes and erects poles, takes charge of lamp equipment at his expense, magnetite arc lamps of 4 amp. and 80 volts," 1.6 cents per hour per lamp and a further option of "Mazda" series incandescent lights under same contract and conditions:
>
> 250 cp. at 1.25 cents an hour per light ($45.63 per year)
> 400 cp. at 1.6 cents an hour per light ( 58.40 per year)
> (Av. ten-hour operation per night)

Consider another form:

> The company installs and maintains the equipment operating lamps ten hours per night—
>
> for 80-watt lamps at $21.00 per year
> 100-watt lamps at 25.20 per year
>
> and a minimum of 25 lamps equivalent to $43.75 per month. But if the consumer will install and maintain the equipment, company will deliver and meter at one service connection energy at the following rate:
>
> Monthly demand 50 kw. or more 2½ cents per kilowatt-hour
> Monthly demand less than 50 kw. 3 cents per kilowatt-hour
> and a minimum of $25 per month.

A final example:

> When the contract is for less than 25 lamps, then lamp replacements are made by the consumer, but if the contract calls for over 25 lamps, then replacements are made by the company.

(See also *Term of Contract*).

*Taxes.*—One schedule was discovered which makes a difference because of taxes as follows:

| Candlepower Rating of Lamps | Annual Rate per Lamp | |
|---|---|---|
| | Where No Pole Tax Is Assessed By Municipality | Where Pole Tax Is Assessed By Municipality |
| 32 cp. | $12.00 | $14.25 |
| 80 cp. | 18.00 | 20.00 |
| 100 cp. | 23.00 | 25.00 |
| 250 cp. | 42.75 | 44.75 |
| 400 cp. | 55.00 | 57.00 |
| 600 cp. | 60.00 | 62.00 |

A variation of $2.25 per year on the small lamps and $2 per year on the others.

*Overhead vs. Underground.*—The most common method of treatment provides that if consumers want underground circuits they pay the cost of the same and the rates stand.

Our "typical rate" states the "annual charge is $5 in addition to the overhead rate for each lamp, plus fifteen cents per foot per annum for all conduit between lamps."

A third method is to state a schedule for each class, thus:

| Candlepower Rating | Annual Rate | |
|---|---|---|
| | Overhead Circuits | Underground Circuits |
| 100 cp. | $22.50 | $37.50 |
| 250 cp. | 43.00 | 58.00 |
| 400 cp. | 57.00 | 72.00 |

*Discounts and Penalties.*—One schedule quotes net rates with no penalties or discounts. Many schedules have 10 per cent penalties for failure to pay within ten days, fifteen days or twenty days of date of presentation of the bill. About an equal number allow 10 per cent discount on the bill if paid in the specified period.

Following is a plan of varying discounts, if payment is made in the designated time:

> Over 25 lamps and less than 50—2 per cent
> Over 50 lamps and less than 100—3 per cent
> Over 100 lamps —5 per cent

Let's look at another one:

> If payment is made within ten days the discount on the bill is as follows:
>
> 10 per cent on the first $50 and 2 per cent on the balance.

Here is a schedule that combines a quantity discount and a prompt payment discount. The statement is:

> Quantity discount allowed on all monthly bills of over $1,000 at a rate in percentage equal to the gross bill divided by 1,000 and having a maximum of 15 per cent for monthly bills exceeding $15,000 (note also the similar provision discussed under number of lamps and minimums. Refer to Typical Schedule.)

The additional prompt payment discount is allowed if payment is made within ten days at the rate of 5 per cent on the first $25 plus 1 per cent on the balance.

*Term of Contract.*—A contract term of five years is the most popular, although some rates are quoted for one year, some for two years with right to renew for three years, others three years, and a few ten-year contracts. Another class quotes rates for varying terms of contract as follows:

| Candlepower Rating | Annual Rate | |
|---|---|---|
| | Three-Year Contract | Five-Year Contract |
| 40 cp. | $14.50 | $13.50 |
| 60 cp. | 18.00 | 17.50 |
| 80 cp. | 19.00 | 18.00 |
| 100 cp. | 24.25 | 23.00 |
| 250 cp. | 44.25 | 42.75 |
| 400 cp. | 59.00 | 57.00 |

This same company quotes rates for underground service, but the differences for each class of lamp between the three-year and five-year contracts is identical with the rate differentials for overhead service quoted above, although there is a $5 to $10 per annum increase over these rates in the stated rate for the underground service.

A second example:

| Candlepower Rating | Annual Rate | |
|---|---|---|
| | One-Year Contract | Five-Year Contract or More |
| 60 cp. | $25.00 | $23.00 |
| 80 cp. | 28.00 | 25.00 |
| 100 cp. | 37.00 | 35.00 |
| 250 cp. | 55.00 | 50.00 |
| 400 cp. | 80.00 | 75.00 |

Another company provides rates which apply to all lamps on, or added to, the existing circuits, under a one-year contract, but where extensive additions to wire plant and equipment are necessary, a five-year contract will be required.

One more citation:

> On contracts of less than five years the consumer shall pay for installing and removing the equipment.

The rates in this case do not change.

The term of contract also has an effect on the rate for additional lamps, as will be brought out under that heading.

*Additional Lamp.*—Difference in rates for additional lamps occurred because of the length of extension required, and also because of the lapsed time under the contract period.

These two factors will be presented separately:

1. *Length of Extension.*—Of 46 schedules studied, sixteen stated definite limitations to the length of extension; one stated that no extension would be made during the contract; two have a rate form which automatically compensates for distance or spacing and the remaining 27 said nothing about the point.

In 209 contracts the extension distances ranged from 250 ft. to 750 ft., with circuits on existing pole lines up to 1,000 ft., for overhead service. About 40 per cent of the total stated 300 ft. as the limit and 28 per cent placed it at 400 ft., with the remainder scattered between the upper and lower limits.

Underground service extensions were provided for by 22 per cent of all the contracts and for distances of 200 ft., 400 ft., 500 ft. Out of the 22 per cent more than 19 per cent are based on a 400-ft. limitation.

If the consumer wants a longer extension he pays for it, either as an addition to the rate, as in the spacing clause in the "typical rate," or by paying for the additional line as in the 6½-page contract, where it costs the consumer $20 for each "additional 120 ft. of line or fraction thereof" over the permissible length of extension and the annual rate remains constant.

Most rates make no difference in the extension distance because of the candlepower of lamps, but there are many that do differentiate. This same contract provides that, for 100-cp. and 250-cp. lamps the extension may be up to 375 ft. in length, and for 400-cp. and 600-cp. lamps up to 750 ft., before the addition previously referred to applies.

One company permits extensions up to 150 ft., or extensions where this spacing is maintained, at these rates:

| | |
|---|---|
| 100 cp. lamp | $24 per year |
| 250 cp. lamp | 32 per year |
| 400 cp. lamp | 42 per year |

to be increased by $4 for each additional 150 ft. in length of extension or spacing, up to 900 ft., adding $20 per year at this maximum length or spacing.

2. *Remaining Life of Contract.*—The large majority of contracts make no change in the rate because lamps are added during the term of the contract, but content themselves by providing that no additions shall be made in the last two years of the contract period. Some, however, say one year and others six months, and one, at least 30 days.

My favorite 6½-page contract has an elaborate system for caring for this item, under the following provisions:

> Additional suspended "Mazda" series incandescent lamps of one hundred (100), two hundred and fifty (250), four hundred (400), and six hundred (600) candlepower capacities, respectively, or equal, shall be installed and maintained according to the terms of this contract at the following rates, terms, provisions and conditions:

RATE FOR ADDITIONAL LAMPS

| Kind of Lamp | Rate for Each Lamp per Annum—10-Yr. Term | 5-Yr. Term | 3-Yr. Term | 2-Yr. Term | 1-Yr. Term |
|---|---|---|---|---|---|
| 100-cp. suspended "Mazda" series incandescent lamps or equal | $26.00 | $29.00 | $30.50 | $31.50 | $34.00 |
| 250-cp. suspended "Mazda" series incandescent lamps or equal | 40.00 | 45.00 | 50.00 | 55.00 | 60.00 |
| 400-cp. suspended "Mazda" series incandescent lamps or equal | 50.00 | 55.00 | 60.00 | 65.00 | 70.00 |
| 600-cp. suspended "Mazda" series incandescent lamps or equal | $55.00 | 60.00 | 65.00 | 70.00 | 75.00 |

Any additional lamps installed during the first, second, third, fourth and fifth year of the contract shall be billed at rates as shown under the ten-year term. Lamps installed during the sixth and seventh years of the contract shall be billed at rates as shown under the five-year term. Lamps installed in the eighth year of the contract shall be billed at rates under the three-year term. Lamps installed in the ninth year of the contract shall be billed at rates as shown under the two-year contract. Lamps installed in the tenth year of the contract shall be billed at rates as shown under one-year term.

Another company adequately provides in this regard, by stating in each contract the following rule:

> Such sum for each 400-cp. type "C" series "Mazda" lamps as is obtained by dividing (*) $37.50 by the number of years and fraction thereof that the contract has to run, and adding to the quotient of said division (*) $36.50.
>
> *In the same contract the amounts stated for 100-cp. lamps are $9.45 and $16.11, respectively. In other contracts different amounts are stated for the various sizes of lamps.

Due to the variation in the amounts stated in the different contracts, what appears to be a consistent rule does not produce results which are consistent. In the same company with the same size of lamps, different annual rates apply and no relative consistency exists in the annual rates for additional lamps.

*Outages.*—This item makes a good trading point, but is not stated in any of the schedules, so that its effect may be appraised as a direct variant of the stated rates. Your attention is called to several methods of dealing with this factor:

> Failure to repair lamps within three hours after reported, deduct 1 cent per lamp per hour, for each hour after three hours. No deduction over 8 cents per lamp per night.
>
> No deductions if replaced in 24 hours after notification of outage.

Again:

> Outages to be allowed by company on a pro rata basis except that outages after midnight at ½ this amount.

The general plan is to allow for outages after a stated lapse of time on a basis prorated on the annual rate.

*Available to Private Consumers.*—Street lighting, or yard lighting, is made available under many schedules to others than the municipalities, when such service can be given from the established circuits without curtailment of the general public service. There are rate differences and differences in ownership operation and maintenance. One example will suffice:

| Candlepower | Annual Rate per Lamp—Private Service | Municipal or Wholesale Service |
|---|---|---|
| 100 | $30.00 | $25.00 |
| 250 | 45.00 | 40.00 |
| 400 | 60.00 | 50.00 |
| 600 | 72.00 | 60.00 |

A $5 to $8 annual differential in favor of the municipal contract.

*Boulevard Lighting.*—This deserves separate treatment, but may be covered here by stating that the same general conditions which are affecting the rates for other classes of street lighting service apply here also. However, customer participation in the cost of installation of lines and equipment is a big factor in this kind of service.

*Candlepower Rating and Statement of the Rate.*—Of course the stated amount of the rate, the "mint sauce," varies as the candlepower rating of the lamps, in all flat rate schedules. This has already appeared through the discussions of the other factors. But the statement of rates may be done in several ways so that no one may quickly perceive the total amount included.

For instance, we find flat rates for 250-cp. lamps quoted at an annual rate of, say, $40 per lamp, and again at "$5 per month per lamp," and a third method "12 cents per lamp per night," and also at "1½ cents per hour per lamp."

Then there is the metered service at so much per kilowatt-hour, as "Rate: 3½ cents per kilowatt-hour for the use of 200 or as many more as may be needed of 40-watt lamps or their equivalent," and with meter rentals of 10 cents per month on all extra meters "whose

use is necessitated in order properly to register consumption in separate isolated installations."

A study of the variation in stated rates produced the results shown in the following table:

| Candlepower Rating | Minimum | Maximum | Annual Rate Grouping: Range of Group | Annual Rate Grouping: Per Cent of Total in Group |
|---|---|---|---|---|
| | | | (Below $15.00) | 42 |
| 40 | $13.50 | $22.00 | $15.00 to $20.00 | 50 |
| 80 | 18.00 | 33.00 | 20.00 to 30.00 | 65 |
| 100 | 18.00 | 60.00 | 20.00 to 30.00 | 74 |
| 250 | 24.50 | 66.00 | 40.00 to 50.00 | 59 |
| 400 | 35.00 | 87.00 | 50.00 to 60.00 | 61 |
| 600 | 40.50 | 90.00 | 60.00 to 70.00 | 57 |

The last column under the heading "Grouping" is added to show a narrower range than the maximum and minimum, which includes the largest part of all the schedules considered. A word of warning is in order: Had a larger number of schedules been considered, there might be some shifting in the limits stated above. They are not all-inclusive and final.

"Well, you have been told enough so that you now know why old man Expediency is a street lighting rate expert," remarked old John Q. as we left the kitchen.

Street-lighting rate schedules are apparently crazy things, and yet withal, methinks, there is method in their madness.

*Making a Contract.*—Let me tell you how a street lighting contract that I know of came into existence.

The city hired an expert to design a new lighting system to be owned, operated and installed by the power company in lieu of the existing system and rates.

Bids were asked for on this basis and the company said $33,000 per year on a ten-year contract. City expert said $25,000 was sufficient. Two years of conferring followed, at the end of which time the company said $33,000 and the city $25,000. The commission was then asked to designate some one as an unofficial observer for further conferences. I was tagged "It."

Another 1½ years of spasmodic conferring—Score, company, $33,000; city, $25,000. Then they asked me for the solution. That was easy; they had four options:

1. Company accept the city's figure.
2. City accept the company's figure.
3. Split the difference.
4. Fight it out in a formal case before the commission.

The parties scratched their heads a while, then the company representatives said: "Well, if you will cut out some of the minor changes to the existing system, and also your expert's high maintenance requirements, and penalties for outages, asking for service under the conditions of the company's standard contract, we will present a new bid for rendering the service."

The city modified its plan in accordance with this suggestion and the company came through with a bid of $28,000 per year for a ten-year contract and the system modernized in accordance with the expert's plan, except for minor modifications to use some of the existing plant. Bid accepted, and all happy.

*Model Rate.*—Is there a model rate? I don't know what you think, but for myself, I am "sold" on the form of rate which has been saved till now. It is simple, uniform and automatically takes care of difference in spacing and has the further advantage of being stated as an inducement rate.

Here it is for your consideration:

Available in all districts served by the company. Applicable to: Series overhead street lighting in boroughs and townships.

Rates:

Two charges—Line and lamp.

Line charge—Rate per mile of line per year, $150.

Line charge—Rate per lamp per year.

| | Lamps | Candlepower: 60 | 80 | 100 | 250 | 400 | 600 |
|---|---|---|---|---|---|---|---|
| First | 100 | $14.00 | $16.00 | $18.00 | $34.00 | $50.00 | $65.00 |
| Next | 100 | 14.00 | 16.00 | 17.00 | 32.00 | 48.00 | 62.50 |
| Next | 100 | 14.00 | 16.00 | 16.00 | 30.00 | 46.00 | 60.00 |
| All in excess of | 300 | 14.00 | 16.00 | 15.00 | 28.00 | 44.00 | 57.50 |

In determining lamp charge, number of lamps of each size shall be considered separately.

Term of contract: Note less than five years, payable monthly.

Provisions: Lamps to burn approximately 4,000 hours per year. Candlepower of lamps is commercial rating of the lamp.

This rate is in effect over a large area in Pennsylvania, and you should understand that my favorable comments express only a personal opinion as to the form. The equity of the monetary values stated have never been established. Furthermore, the inducement features in this rate may, like the inducement features in schedules for other classes of service, be set so far out on the use side as to be beyond the reach of many small consumers. However, I commend this rate to your attention, for it does, simply and uniformly, what the other forms of schedules try to do through complexed considerations and expert juggling of items.

*Analysis of 209 Contracts.*—I have had made a study of the street-lighting contracts with 209 towns. The total population served under these contracts was 745,159, receiving 3,999,469 nominal candlepower on an average of about ten hours per night for a total cost of $654,113 per year. If we had taken more cases and plotted the data for each individual case, we would have found most of the available space between the extremes solidly occupied by the critical points of our curves.

Following is a tabulation showing the extremes and the average for all contracts:

| Item | Minimum | Maximum | Average |
|---|---|---|---|
| Population of town | 58 | 64,400 | 3566 |
| Candlepower per capita | *0.66 | *27.1 | 5.37 |
| Cost per capita | *$0.23 | *$6.50 | $0.88 |
| Ratio cost to cp | 1.7 | 9.9 | 6.1 |

*Minimum cost and minimum candlepower occurred in the same town with a population of 1,092 and a ratio of 2.9 cp. per dollar. Also the maximum cost and candlepower occurred in one town with a population of 207 and a ratio of 4.2 cp. per dollar.

We were, of course, looking for trends, and here's what we found:

The per capita cost increased as the size of the towns decreased.

The per capita candlepower increased as the per capita cost increased and, therefore, also as the size of the towns decreased.

The candlepower per dollar per year, though fluctuating between wide limits, did not change either with the changing cost per capita or size of towns.

The foregoing statement of trends is only true for the large number of cases taken. If selection had been resorted to, undoubtedly the results could have been reversed.

## Conclusion

Teacher always said, "Don't mix metaphors," and I haven't when I sum up the situation by saying, that what goes into the "street-lighting rate hash" in any town is principally a matter of horse trading, and the utility rate man has a large "stable" from which the town may choose.

# Power Cable Takes to the Air

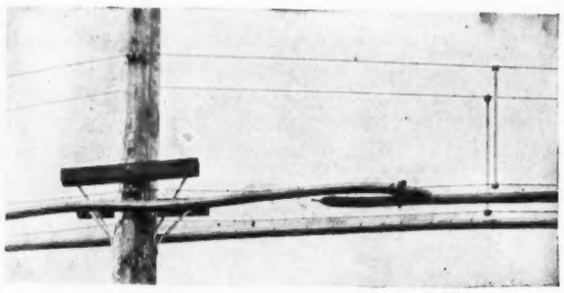
Detroit installation required origination of methods and devices to solve construction problems. Modified catenary support minimizes trouble from faults and permits use of small sag

By H. G. HALL and F. L. OSGERBY

*Superintendent Underground Lines Department and Engineer, Respectively, Detroit Edison Company, Detroit, Mich.*

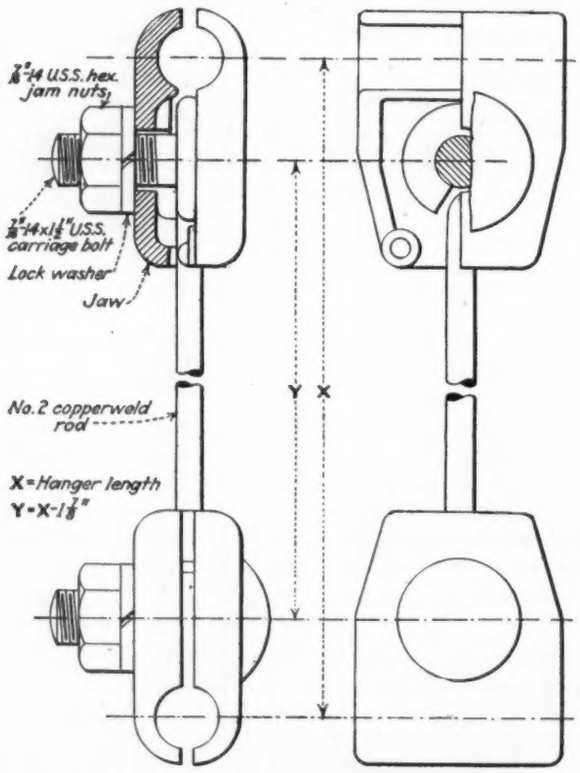
THE installation of cable on poles is not a new thing under the sun. Telephone cables have been so installed for years and there have been a few isolated instances of aërial power cables. But overhead power cable has not been so commonly accepted as to have developed a detail of art and technique in installation and operation in any way comparable to the practices of the use of cable underground. However, the development of this art and technique has been greatly accelerated by a recent installation on the 24-kv. system of the Detroit Edison Company.

A feature of the Detroit construction that may survive as a major contribution to the aërial power cable art is the modified catenary suspension using two messengers. The first reason for the adoption of this construction for the messenger was protection against destruction of the support in case of cable failure. The company's 24-kv. transmission system is operated with a solidly grounded neutral, and considerable burning sometimes results from faults. With single messenger construction, should a failure burn through the steel messenger supporting the cable, considerable damage to the adjacent poles, messenger, guys, etc., might occur due to the loss of support for a cable of this weight; also, there would be additional delay in repairs due to necessity of rebuilding several spans of messenger and picking up the strains. The cable used was 350,000-circ.mil, three-conductor, 10/32-in. paper, round, shielded conductor with $\frac{9}{64}$-in. lead sheath hardened by the addition of one per cent antimony and having an over-all diameter of 3.15 in. and a weight of 12.55 lb. per foot. As far as known, this is larger and heavier than any cable previously adapted to aërial use. The secondary reason was that the sag in the cable could be much reduced and better operating conditions for the cable would therefore result at very little additional cost.



*Ready for the Splicer*

Ratline ties at poles not yet made.




*Design of Messenger Hanger*

As shown in the illustrations, the cable is supported by rings from a lower messenger, which in turn is suspended from an upper messenger by hangers spaced 10 ft. apart. The messengers are $\frac{7}{16}$-in. high-strength galvanized steel strand (16,000 lb.). The attachments to the poles are made with standard clamps and items of hardware like those used in other aërial cable installations. U-bolt clamps are used for splices and dead ends.

The upper messenger is given an initial sag such that it can carry the cable with ice and wind load without exceeding its elastic limit. For a 120-ft. span at 60 deg. F. this is about 12 in. The lower messenger is given the same initial sag, and the hangers between messengers are of such length as to give approximately this same sag when completed. When the installation is complete the upper messenger has a sag of about 46 in. In this

way either messenger is capable of carrying the weight of the cable and the hangers are more easily installed between messengers than if it were attempted to have no sag in the lower messenger and cable.

The stresses to be taken care of in dead ends and guys are no greater than are encountered with smaller cables and a single messenger. The messenger strand is used for guying and anchors are made by boring a hole to a depth of about 7 ft. with a boring machine, driving two anchor rods in at an angle, attaching steel plates to the lower ends in the hole and pouring concrete in the hole to a depth of about 2 ft. A precaution to compensate for all slipping of anchors, guys, attachments to poles or kinks in the messenger was taken by pulling the messengers tight and letting them set a day or two before giving them the specified sag. Another precaution against the messenger slipping through to sections where cable was being pulled into the rings was taken by installing temporary guys with false dead ends attached to the messengers at approximately every fifth pole.

*Belled Pipe Support Used When Pulling Cable at Far Joint Out in the Span*

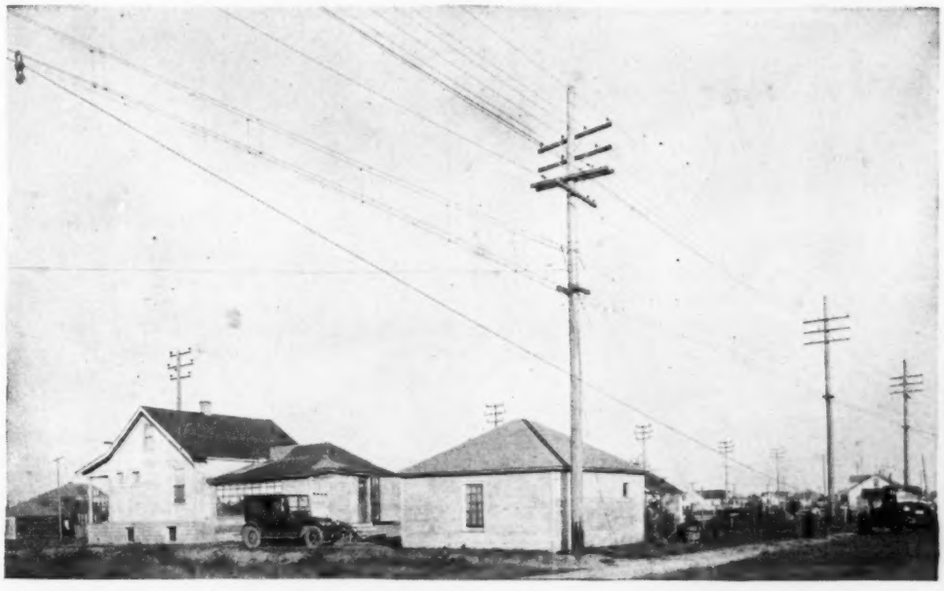
The hangers are comprised of jaws that clamp to the messengers and "Copperweld" rods cut to length and bent in a loop at each end. The rods are cut and bent in the field, using a special jig. The shortest hangers used are about 18 in. between jaw centers, so that any burning from arcs at the cable would be confined to the lower messenger. This also proves an advantage in that a man is able to walk the spans and riding the messenger with a safety chair is only necessary when installing rings. The lengths of the hangers are calculated from the assumption that the curves taken by the messengers are both parabolas, using the formula:

$$h = C\ (1 - x^2/L^2)\ (S_1 - S_2)$$

Where $h$ is the hanger length, $C$ is the separation of the messenger at the poles, $x$ is the distance of the hanger from the center of the span, $L$ is half the span length, $S_1$ is the sag of the upper messenger and $S_2$ is the sag of the lower messenger. A 48-in. separation at the poles has been used for all spans 120 ft. or less in length and the sags calculated for equal horizontal tension at 60 deg. F. For longer spans greater separations are used and treated as special designs.

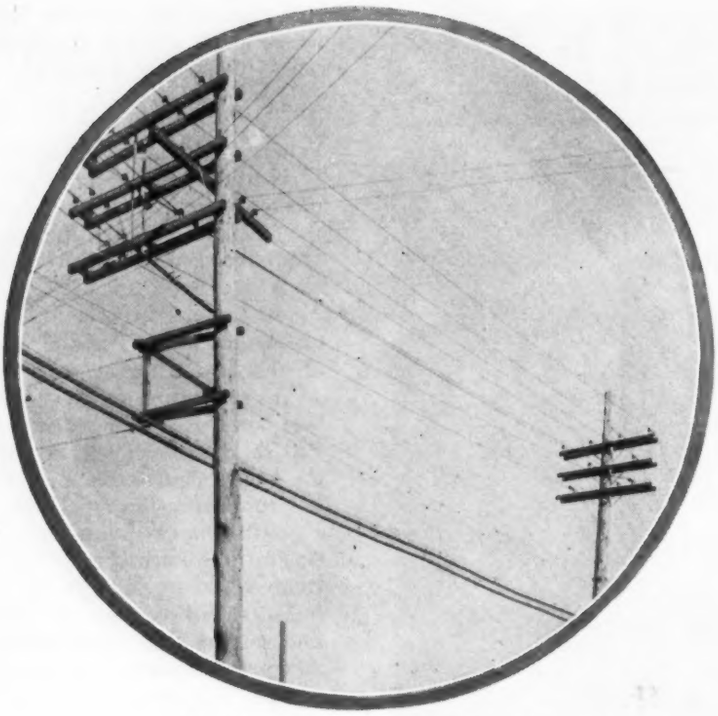
To avoid angles in the line where poles are offset, a wooden bracket was designed to carry the messengers. This bracket also proved useful in carrying the line through straight-in places where guying would have been difficult without it. At dead ends and where guys exert a heavy down pull on the pole a hole 2 ft. in diameter was bored for the pole and concrete poured in to a depth of 1 ft. before the pole was set. After setting the pole in place more concrete was poured in and tamped around the base.

Four-inch single loop rings are spaced 8 in. center to center on the lower messenger to carry the cable. At the poles two rings are omitted and six wraps of $\frac{1}{4}$-in. ratline is substituted for each ring. This method of support is also used at all horizontal and vertical bends in the cable where the steel rings might cut the cable sheath. After the messengers were in place and the rings installed the cable was pulled in and spliced. Pulling eyes were attached at the cable factory.

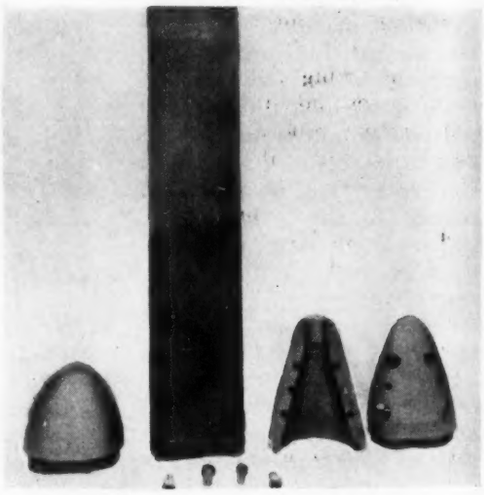


*Temporary Guys Installed at Every Fifth Pole to Take Pulling*

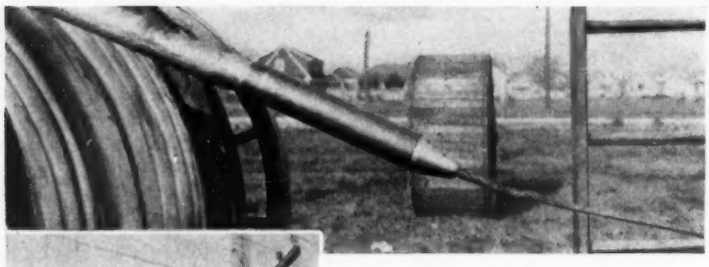
# *Kinks in Construction of Aërial Power Cable*



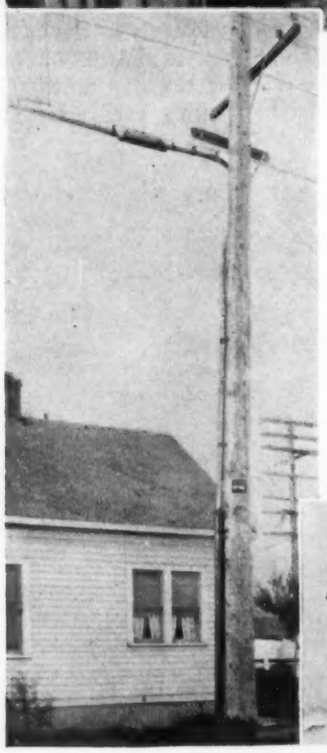
*Wooden Bracket for Carrying Line Through Pole Offset*



*Construction of Tapered Head for Threading the Pulling Line and for Pulling in the Cable*

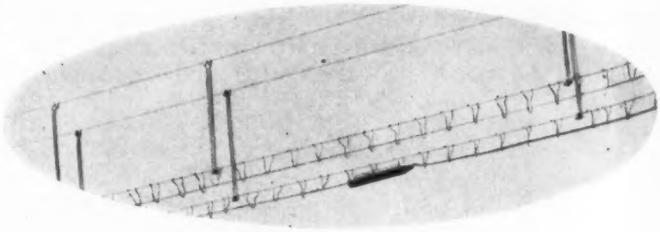


*Attachment of Tapered Head to Cable End for Pulling In*

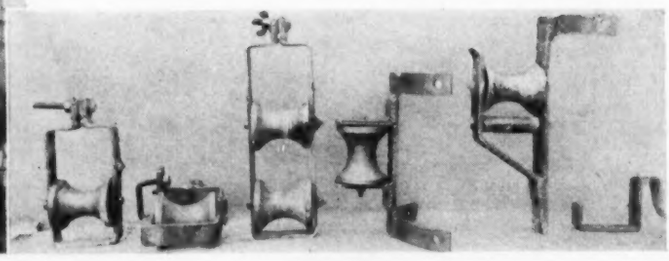


*Expansion Bend in Cable as It Enters Underground*

Note the bond at the joint center.



*Threading the Pulling Line Through the Rings*

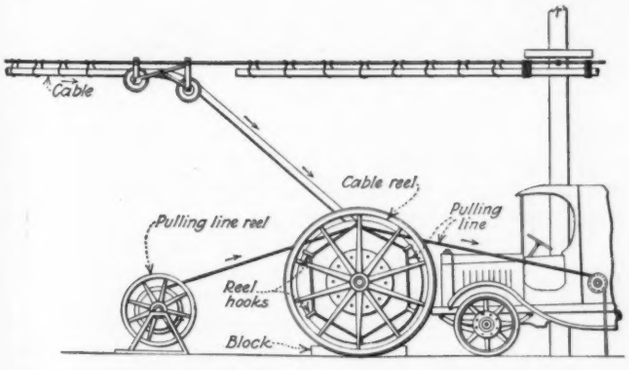


*Sheave and Pulley Equipments Used in Installing and Removing Cable*

At the right is one of the hooks which are fitted over the chime of the reel when pulling out cable.

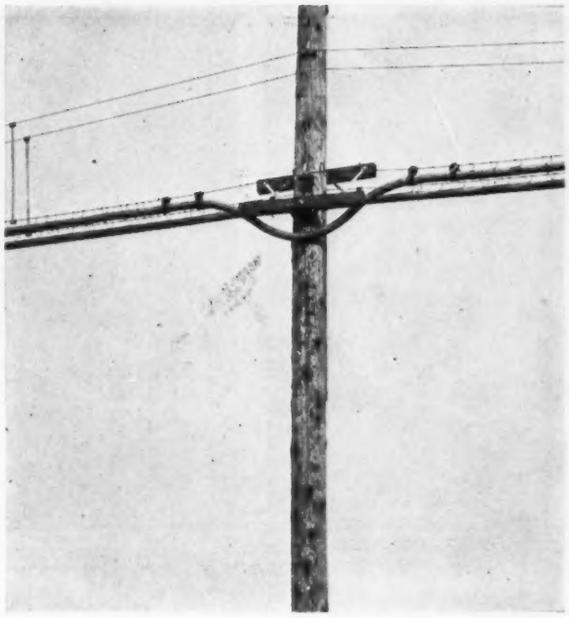
There was some trouble experienced in threading the pulling line through the rings, as the swivel connection on the end of the line caught in the rings and displaced them and in some cases threw them off the messenger. A covering device consisting of a steel cylinder with a tapered head was developed to eliminate this difficulty. This device is also serviceable for the same use in pulling in the cable.

With cable of this weight to be pulled onto a messenger 25 ft. above the ground some support must be provided for the cable between the point where it leaves the reel and the two-wheeled sheave at the messenger, otherwise wrinkling of the lead sheath will result. Rollers bracketed to the pole serve this purpose if the cable is so spaced that the ends come near the pole, but when the ends are at or near the center of the span, some other means of support must be provided. After experimenting with several schemes without success, the one illustrated was finally adopted. This device consists of a 10-ft. section of iron conduit having the ends "belled out" to prevent injury to the sheath, and a means of support in the center. It was found that cable of this weight was self-supporting without wrinkles in the sheath when at an angle of 45 deg. from horizontal for a distance of approximately 12 ft. With a 10-ft. support in the center, it was permissible to set the reels some distance from the sheave so a short bend was avoided where the cable enters the rings. Anhydrous soap ("soft soap") was used to lubricate the cable during pulling. This washes off in the first rainstorm without injury to the public that other greases might cause. Cable can be removed very readily by reversing the pulling operation and applying the pulling strain to the reel, as shown in the sketch.




*Method of Taking Out Cable by Applying Pulling Strain to the Reel*

Some expansion and contraction of the cable will take place over the load or temperature cycle. A liberal bend is therefore installed at the poles where the cables enter the underground conduits. Expansion, if too pronounced, causes crowding and cutting at the poles, and contraction might exert too great a strain on the conductors and joints. Expansion loops were installed at intervals on one line to study the effect of load and temperature cycles. The joints are identical with the joints made on underground cable of the same size and class. They are supported at each end with $\frac{1}{4}$-in. ratline, similar to supports at the pole. In addition, a $\frac{1}{16}$x1-in. copper band is wrapped around the joint and soldered to the messenger and the lead sleeve of the joint. This bonds the cable to the grounded messenger and supports the joint.



*Loops Installed at Intervals to Study Expansion and Contraction Effects of Load and Temperature Cycles*

The features of this type of construction which are believed to be advantageous may be summarized as follows:

1. The cost is believed to be very little greater using two messengers than it would have been for a single messenger, due to smaller wire, decreased stringing tensions, lighter anchorages and ability to use standard hardware, as against the addition of hangers and extra space on the poles.
2. Protection is provided against loss of support in the event either one of the messengers should be broken or burned, neglecting any sustaining action that the cable itself might have.
3. The sag in the cable is kept relatively small.
4. Two messengers in many instances make the installation and joining of the cable easier by permitting walking the spans.

The cable has not been in service a sufficient length of time to justify any recital of operating experience. Such things as sheath cutting and the effect of temperature variations can be determined only after several years. The present line is in the nature of an experiment, and many of its features are thus still in the experimental stage.

## 30 to 50 Foot-Candles Used in Jantzen Mills

MORE than a million bathing suits will be produced this year in the Jantzen Knitting Mills, Portland, Ore., in its newly relighted factory under lighting intensities ranging from a minimum of 30 foot-candles to 50 foot-candles. Spot or local lighting over sewing machines has given way to general illumination, as shown in the accompanying illustrations. In making this change $6,000 worth of gooseneck lighting equipment was junked and a total of $12,000 to $15,000 was invested in new lighting. Three-hundred-watt lamps in "RLM" reflectors, spaced 6 ft. x 7 ft. with a mounting height of 8 ft. 2 in., raised the average lighting intensity in the plant from 2 foot-candles to 35 foot-candles and increased the total lighting load from 35 kw. to 100 kw. In the sewing machine section of the factory the load was increased

*$6,000 Worth of Local Lighting Equipment Junked to Relight Sewing Section of This Mill*

from 4 kw. to 40 kw. with a resulting average intensity of 50 foot-candles.

The illuminating engineering division of the Portland Electric Power Company is responsible for selling this better lighting job and it is only one of several modern high-intensity industrial lighting jobs to be sold recently by this central station.

Management of the Jantzen Knitting Mills is highly pleased with the new lighting installation and estimates that production has been increased from 15 to 20 per cent as a result. Moreover, 750 workers have been relieved of eye strain, the morale of employees has been greatly improved and a garment of better quality is being produced.

# Mr. Employer

By Herbert F. Taylor

*Editor and Manager Journal of the Worcester Polytechnic Institute*

CERTAIN young engineers are about to enter your organization. They are men of more than average intelligence and ambition, of more than ordinary promise. Your eagerness to employ them is an evidence that you recognize their potential worth. It is not within the province of the college to dictate the treatment that these recruits shall receive. The college has more than a passive interest in their welfare, however, and feels justified in making suggestions that may be mutually helpful.

These men—they are no longer boys—are serious minded for the most part, but they have a well-balanced sense of humor. Their training has made them alert, industrious and self-confident. They possess no overweening idea that they "know it all," which is contrary to some conceptions of the young graduate.

Engineering education is a skillfully designed structure. Students progress from a substantial foundation of sciences and mathematics, along a framework of engineering fundamentals, to a superstructure of interesting and intricate problems.

It frequently happens that graduation into industry means a plunge into a dull routine that offers few opportunities to exhibit highly trained analytical abilities. If this routine is a necessary step in their progress, as it frequently is, a careful explanation of the fact will create a healthier attitude.

Colleges cannot teach judgment; that comes from experience. These men have a fair amount of common sense, and their judgment will develop in direct ratio to the amount of responsibility that is given them. It is well for them to make some mistakes if the penalties inflicted are not too severe. Make the penalty a heavier responsibility and see how they rise to it.

Young graduates need not be considered a dead loss during the period of finding themselves. Your business is all new to them, and they are eager to learn it. Idle drifting around the plant is not their idea of learning, however. They have been trained to work hard, and not having enough to do is their greatest source of discontent.

You have chosen men from the small group that has survived a long and arduous process of elimination. They are your investment for the future. Handle them intelligently, pay them all they are worth, give them a word of praise when it is merited or of encouragement when it is needed. Some day they will step up and take your job, which is what you had in mind when you hired them.

# Letters from Our Readers

## *Line-Start Motors in Large Sizes Must Be Special*

*To the Editor of the* ELECTRICAL WORLD:

In the May 4, 1928, issue of the ELECTRICAL WORLD G. R. Anderson proposes in his discussion of line-start motors that "line disturbance current," defined as the starting current divided by the starting power factor, be used as a means of comparison of starting currents.

The new types of line-start motors present a more difficult problem than that of defining the starting current to the operating companies whose rules place a limit on the size of standard design squirrel-cage motors. Until within the last two or three years the rules of the company with which the writer is connected, in common with those of many other operating companies, provided that all motors over 30 hp. shall be of the slip-ring type.

Experience with new customers during the past few years has proved the necessity for a definite limit. An example of this is found in grist mills, which, in both the attrition and hammer types, have become increasingly popular in Illinois. On the lines of this company there are many towns where the grist mill is by far the largest single customer and a substation which will carry the mill is adequate for other requirements of the community.

Facilities which have sufficient capacity to provide for the running requirements of a slip-ring motor with a starting current only about one and one-half times its running current will start the motor without voltage disturbance. The investment in equipment, in the towns referred to, which would be necessary to maintain voltage during starting for squirrel-cage motors of standard design in sizes over 30 hp. would be out of all proportion to the revenue.

Line-start motors have characteristics intermediate between those of the standard squirrel-cage and slip-ring types and it is logical to permit their use in certain sizes larger than 30 hp. Up to date the application of these motors on the lines of this company has been primarily for grist mills and they have been approved in 50, 60 and 75-hp. ratings for 3,600-r.p.m. hammer type mills and for attrition mills using two 40-hp. or two 50-hp. 1,800-r.p.m. motors.

Application of these motors has been based on the principle that the customer should be allowed to use line-start motors with compensators or without provided that they do not draw more current from the line than that allowed under the N.E.L.A. rules for standard 30-hp. squirrel-cage motors, 360 amp., and provided that they will accelerate the load to full speed within a reasonable time.

It is to be particularly noted that motors of standard design in sizes over 30 hp. are not approved even if connected to taps on the starting compensator which will limit the starting current to 360 amp. This is for the reason that the starting torque would be low and difficulties would be encountered in many applications which are not anticipated with the line-start motor.

If the so-called double squirrel-cage motors are to be connected in sizes above 30 hp. they must have a better ratio of starting torque to starting current than the standard motor, and it is on this basis alone that their use is approved. Data for the motors of one manufacturer show average ratio for ratings of 20 to 60 hp. inclusive, at 1,800 r.p.m., to be 0.28, 0.40 and 0.56 for the standard design, normal-torque, low-starting current and high-torque, low-starting current types respectively. The characteristics are fairly consistent. For example, the maximum and minimum values of the ratios over the given range of horsepower ratings for the normal-torque, low-starting current design are 0.46 and 0.36.

On the basis of these data the 1,800-r.p.m. motors of this manufacturer have been approved in the 40-hp. rating for the normal-torque, low-starting current design and in the 40, 50 and 60-hp. ratings for the high-torque, low-starting current type.

Motors of 3,600 r.p.m. are used on hammer type grist mills. These motors, which are of the two-pole type, are inherently poorer in design, in regard to starting torque, than slower speed motors. The 60-hp. high-torque, low-starting current motor of the manufacturer referred to above has a ratio of starting torque to starting current of only 0.31, but has been approved because no other suitable type of motor is available and because it accelerates the mill to full speed in fifteen seconds with 360 amp. drawn from the line. Also, it is highly improbable that the customer would remove this high-speed motor from the mill and use it for any other application.

Two 75-hp. hammer type mills are now in operation. The motors accelerate the mills in about 25 seconds. However, the compensators are provided with three taps and the starting current on the intermediate tap is approximately 420 amp. and on the lowest tap only about 250 amp. The performance would be improved if a tap were available which would give a starting current of about 360 amp.

An objection which is sometimes raised to these motors for applications of this character is the possibility of increased power bills due to lower efficiency. Data from several manufacturers show that the difference in efficiency is negligible. In general, at full load it is not more than 2 per cent, and in some cases it is less than 1 per cent. The difference in full load power factor is small and in some cases the power factor of the special motors is better than that of the standard motors.

H. C. BARTHOLOMEW,
Distributing Engineer.

Illinois Northern Utilities Company,
Dixon, Ill.

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## *Relation of Capital Expenditures to Wage Earners*

*To the Editor of the* ELECTRICAL WORLD:

In the June 29 issue of the ELECTRICAL WORLD, on page 1318, under the heading "Attempts to Discredit Utilities Personally Affect Wage Earners," you say, "figuring on a basis of an average income of $1,500 to $1,800 a year for this class of worker." This is too high. According to actual figures as we have been able to obtain them, in at least three large central stations in the Eastern United States the average wage is less than $1,400, and in many cities will run from $1,200 to $1,300. We very much doubt if you can name a single example of an average wage of $1,800 in the whole central-station industry. Accuracy is important in this connection, for through it, this one real fault of the electric light business might be rectified.

R. S. WHITE.

Washington, D. C.

EDITOR'S NOTE: The 1922 census gives the average wage of all employees in commercial establishments as $1,426 per year. No later general data are available. The editorial referred to the effect of capital expenditures on all wage earners, not just utility employees.

# Digest of Electrical Literature

## *Generation, Control, Switching and Protection*

*High-Voltage Fuse.*—M. BOUTIN.—This new type of fuse cutout has been developed in an endeavor to protect secondary feeders of 3,000 to 60,000 volts against possible damages by short circuits, with apparatus less expensive, smaller, quicker and more reliable than automatic oil switches or relays. Essentially the cut-out consists of a tall, cylindrical vessel with a metallic cover and two condenser type bushings. One of the two bushings has attached to its lower end within the vessel a steel explosion chamber, in the center of which is located a short piece of thin silver wire to the other end of which is fastened a molded compound piston, which can slide in the barrel-shaped end of the explosion chamber. From the lower end of the piston extends a long flexible copper cable to the other bushing. The vessel is filled with oil up to the explosion chamber. At short circuit the silver wire melts and the gases, reaching a pressure of about 650 lb. per square inch, shoot the piston downward in the oil, rupturing currents of 12,000 amp. or more within less than one cycle. Elaborate mathematical formulas are given for the calculation of the size of silver wire to be used for any desired protection. An auxiliary device may be attached to the oil vessel to trip breakers or relays after the cut-out opened, deriving its motive power from the oil pressure in the cut-out.—(*Revue Générale de l'Electricité*), June 8, 1929.

## *Transmission, Substations and Distribution*

*Economic Voltage for Light and Power Distribution.* — W. CHRUSTSCHOFF. — Investigating mathematically the economic difference between 110- and 220-volt a.c. lighting systems, the author points out that the generally accepted European preference for 220 is unfounded, and that, considering all factors, the lower voltage should always be given preference in well-settled territories. The gas-filled lamp consumes 26 per cent more energy at 220 volts than at 110 volts, the lamp is more expensive and has shorter life. Voltage fluctuations must be kept lower, the installations are more costly and personal danger is much higher at 220 volts. Considering the smaller no-load losses in transformers for higher voltage, the over-all difference for a 5,000-kw. supply is only 0.6 per cent in favor of the higher voltage. The writer concludes that what little advantage there is in favor of a 220-volt supply is certainly only on the part of the service company, not from the consumers' standpoint. He claims that large sums are lost annually in small and large systems where 220 volts are used, when 110 would be the much more economic voltage.—*Elektrotechnik und Maschinenbau*, June 16, 1929.

*Solution for Transients.*—Transient solutions of electrical networks may be based upon the fact that a distortionless line can be made to approach as a limit all three of the circuit elements—resistance, inductance, and capacity. The solution consists in determining the current in a distortionless line and then proceeding to the limiting case of the distortionless line which approaches the element or elements of interest. A formal solution of the Laplacian integral equation is given.—*Bell Telephone Laboratories Reprint* B-375.

*Potentiometer Regulators.* — CLAUDE W. HILL.—Outline of a number of variations in a method of changing and reversing the field current of the special generators employed for the control of motors on the Ward-Leonard system. The author has accompanied the discussion with formulas and illustrative diagrams as well as test curves indicative of values which may be obtained through the utilization of the devices which are discussed.—*Electrical Review (England)*, June 7, 1929.

## *Units, Measurements and Instruments*

*Cathode-Ray Oscillograph with Continuous Film Supply.*—P. HOCHHAUSLER.—The Dufour oscillograph with the photographic plate inside the vacuum has many advantages over the so-called outside plate type. While it is possible to provide a plate-changing device on the Dufour construction, the actual number of available plates is limited, and when all of them have been exposed the vacuum has to be broken, the plate magazine must be reloaded and a new vacuum has to be pumped, all of which consumes much time. Two devices are described which avoid this troublesome feature. One utilizes a long, rectangular glass tube attached to the bottom of the oscillograph. This tube is filled with mercury, through which passes a standard strip of motion-picture film, pulled from a roll within the vacuum to a take-up roll outside, without disturbing the vacuum. A motor drive on the take-up roll keeps the film moving at a speed of 20 to 50 mm. per second. This speed is so slow compared with the recorded phenomena that it may be neglected. The second method is based on the principle of the canal lock. The bottom of the oscillograph has a large, ground-in, vacuum-tight cylinder, which holds three plates at 120 deg. One of these plates is in the vacuum in recording position, the second is outside, where it can be changed, and the third is in a position where it can be connected to the vacuum pump. After exposing the first plate, the cylinder is turned 120 deg., which brings the third plate into the vacuum, the second into the evacuating position and the first comes out. For lightning investigations the first method gives excellent service, because it remains active for several hours without attention, particularly if combined with an automatic ray initiation, which keeps the light spot off the film and swings it onto it when a disturbance occurs. For laboratory tests, where many consecutive exposures of known time instant are to be made, the second method will also be found very convenient. Samples of records with both methods, drawings of the instruments and new connection diagram for automatic initiation are included in the paper.—*Elektrotechnische Zeitschrift*, June 13, 1919.

*Measuring of Average Maximum Demand.*—W. JANICKI.—To determine the average maximum demand from a recording wattmeter requires planimetric evaluation of individual, isolated sections of the record. To avoid this, the writer recommends a combination of wattmeter and maxigraph in one instrument. A Swiss construction of this type is described in detail. Both instruments are mounted side by side in one container and are actuated by a common drive. An electrically wound spring motor moves the recording paper. Specially prepared paper and a dry disk type stylus obviate the customary troubles with ink and pen recorders. The maxigraph makes a measurement and the corresponding record in the shape of a straight line every five to 30 minutes, depending upon the chosen time interval. The length of each recorded straight line is a direct measure for the load at that instant. The meter can be arranged to read single, three phase or direct-current load, and one to three different tariffs. For ambulant use a special portable set is available.—*Revue Générale de l'Electricité*, June 15, 1929.

*General Theory and Earthing Device of Alternating-Current Bridges.* — KAZUKIYO OGAWA.—The balanced condition in the alternating-current bridge is usually derived upon the assumption that the bridge is so perfectly isolated from the earth that there is no necessity to consider the capacity effects of the earth. According to the author, practical conditions alter this theoretical ideal and the results obtained on the above assumption can only be approximately true unless the earth capacity effects are eliminated by some means. Several methods proposed to eliminate the earth capacity effects are enumerated, and an improved device that would be capable of eliminating these effects is described. The discussion tends toward the mathematical and among the problems considered are: Equivalent

networks, general balance condition for any alternating-current bridge, general features of earth capacity effects, balance condition for earthing device, special transformer for earthing device, high-frequency alternating-current bridge, and alternating-current bridge where one terminal is earthed. A number of formulas suitable for developing the various elements covered in this discussion have been included in this treatment of the grounding problem.—No. 254 *Researches of the Electrotechnical Laboratory (Japan).*

## *Electrophysics, Electrochemistry and Batteries*

*Location of Faults with X-Rays.*—C. KANTNER.—The visual examination of an X-ray negative is uncertain and depends largely upon the acuteness of the observer's eyes. To eliminate the personal element, the author has developed a novel examination method, in which the observer's eye has been replaced by a photo-electric cell. The negative is laid on a transparent table, above which is arranged a small light, which can throw a slim ray of light downward through the negative. Under the table is a photo-electric cell, which receives the beam of light, after having passed through the negative. Light and cell are at the ends of a U-shaped arm and can be moved together over any part of the negative. A constant potential, applied across the cell, is carried to a galvanometer, which deflects another beam of light, used to record the density curve on a sheet of photographic paper. The resulting curve is a direct indication of the varying degrees of contrast in the X-ray negative, and the recording is absolutely independent of the visual ability of the recorder.—*Zeitschrift des Vereines Deutscher Ingenieure,* June 15, 1929.

## *Traction*

*Railway Electrification in Switzerland.*—The acute coal shortage in Switzerland during the World War brought about the decision of the Swiss railway federation to utilize the plentiful hydro-electric power of the country and to electrify the entire railway system of the land, comprising a total of 1,800 miles. In addition to these there are 1,600 miles of privately owned railways, or altogether 3,400 miles. At the end of 1928 the first part of the large electrification program was finished, so that today Switzerland has 2,100 miles of all its railways electrified, representing 62.5 per cent, which is a world record by a wide margin. The country has standardized the 15,000-volt, $16\frac{2}{3}$-cycle, single-phase system, supplied from a 66- and 135-kv., $16\frac{2}{3}$-cycle national single-phase bus, covering the entire country and tying all the railway generating stations into one system. A great many problems concerning the network and the traction had to be faced, many of them without precedent, and their successful solution is outlined in this interesting report.—*Elektrotechnische Zeitschrift,* April 25 and May 16, 1929.

*Regenerative Braking.*—LORIA L. VELLARD.—The writer reviews mathematically recuperative breaking methods for a.c. and d.c. locomotives. For three-phase induction motors with wound armature and collector rings, such as are used on several Italian lines, regeneration is possible only when the train has to descend long, uninterrupted grades without stops. Since such conditions are rather rare in mountainous regions, the method is used seldom with success. For single-phase commutator motors regenerative braking is more successful, but its use calls for considerable complications, which make the economy of this system somewhat doubtful. It seems that only the direct-current motor can be recommended unreservedly for dynamic braking with various methods of applications to choose from. Road conditions, motor design and locomotive type are determining factors for the most suitable method of direct-current regenerative braking.—*Revue Générale de l'Electricité,* June 15, 1929.

## *Hydro-Electric Development and Steam Equipment*

*Hydro-Electric Developments in Canada.*—The potential and actual development of water-power sites for the generation of electricity in the several provinces of Canada has been covered in a group of articles in this issue of the *Electrical News.* Details regarding the various sites, the local conditions governing the developments and a brief outline of the organization and characteristics of the companies operating these developments have been included. The recently constructed Grand Falls power house on the St. John River, N. B., is described and several unusual features include what is said to be the largest pressure tunnel in Canada, unusual arrangements of the intake, differential surge tanks, improved type penstock, the tunnel entrance, wye branches, power house butterfly valves, plate steel scroll cases and draft tubes.—*Electrical News (Canada),* June 15, 1929.

*Modave System of Dust Extraction from Flue Gases.*—Based upon the theory that a large proportion of the dust in the flue gases may be trapped by placing cyclones in the flue or by washing out the solid matter before the top of the chimney is reached, a method of removing solid materials from the flue gases has been devised which is fundamentally a washing proposition. This device consists essentially of a number of hollow rectangular elements, the area of which depends on the quantity of air that has to be treated. Water flows from a tank into the individual elements through a series of calibrated orifices and from each orifice a pipe extends downward for some distance into the interior. Each element is thus filled with water, which overflows and trickles down over the outer surface. The elements are arranged vertically. The path of the gases is perpendicular to the axis of the elements and owing to the arrangement of the latter is tortuous. The shape of the elements is such that intimate contact occurs between the gases and the water and both small and large particles of solid matter are effectively extracted. As the equipment has no moving parts, among the advantages claimed for it is that it requires no supervision and absorbs no power for operation. To insure proper working it is only necessary that a continuous supply of water shall be maintained. The efficiency, based on the amount of dust in the gases before and after treatment, is stated to be 90 per cent. Extractors of this type have been installed on two boilers with a heating surface of 21,528 sq.ft. Satisfactory results are said to have been obtained. — *Engineering (England),* June 28, 1929.

## *Miscellaneous*

*Safe Distances Between Live Parts.*—A. TROQUET.—Rules of various national societies and private companies have established minimum safety distances between live parts and to ground for indoor and outdoor installations. The distances are given either in tabulated form or can be calculated from formulas for any given conditions. The author compared a number of these rules and finds considerable variations. He gives in this paper three of the most widely used distance formulas and lists the average values obtained from a number of distance tabulations. The values are segregated into transmission line spacing, outdoor substation spacing and indoor station spacing, covering a voltage range from 110 to 220,000 volts for this type of equipment.—*Revue Générale de Electricité,* June 22, 1929.

*Karolus Picture Transmission.* — P. ARENDT.—For news service in England, Germany and Japan, the Karolus picture transmission system, as developed by Siemens and Telefunken, is in regular, daily operation. During the 1928 coronation festivities in Tokyo an average of 60 photos was transmitted daily to Kyoto and Osaka. The paper describes the latest refinements introduced in the apparatus, particularly the local speed synchronization between sender and receiver by means of a tuning fork arrangement. With a density of five lines per millimeter, a 10x10-cm. photo can be dispatched in about 30 seconds, using a carrier frequency of 9,000 cycles over an overhead line. Equipments are now in operation in Paris, London, Glasgow, Berlin, Frankfort, Copenhagen and Stockholm. The receiving element of this type of apparatus is a nitro-benzol immersed condenser, which bends a ray of polarized light passing through the dielectric in proportion to the potential applied to the two plates of the condenser.—*Elektrotechnische Zeitschrift,* May 23, 1929.

# News of the Industry

## Columbus, Ohio, Cuts Rates

Application of the Columbus Railway, Power & Light Company for authority to make a cut of approximately 1 cent per kilowatt-hour on electrical energy sold to domestic and commercial consumers of Columbus has been approved by the Utilities Commission. The new rate, which went into effect August 1, means a reduction from 7 cents to 6 cents per kilowatt-hour for the first 50 kw.-hr. used each month and from 6 cents to 5 cents for the next 75 kw.-hr. Further reductions in rates to consumers of electrical current, as the public realizes the many advantages offered in its use, were predicted by Benjamin W. Marr, president of the company.

Mr. Marr said that in voluntarily cutting revenue by a half-million he was acting on the theory that the rate reduction would result in more widespread use of electrical energy. Electricity is not now being used to a large extent for cooking in Columbus, he said, but this would come with the lowering of rates.

## Status of Electric Bond & Share Case

No further court action will be taken in the case of the Federal Trade Commission against certain officers and employees of the Electric Bond & Share Company before September 16, according to a stipulation entered into by both parties and signed by Judge Knox of the United States District Court, Southern District of New York. The stipulation provides that each party shall have until September 16 to decide what course it shall pursue.

As yet the Federal Trade Commission has not decided what course it will pursue.

## Seattle Makes Formal Application to Divert Water

The city of Seattle in two applications just filed at the Washington State Hydraulics Office seeks the enlargement of its Skagit Gorge and Diablo Canyon power projects on the Skagit River so that these two units will have an increased output of 67,057 electrical horsepower. The plants, which now have a combined output of 273,000 hp., are in eastern Skagit County in the northern part of the state and in the rugged west ribs of the Cascade Range.

Under state permit No. 166, issued in 1920, Seattle received the right to 3,500 sec.-ft. of water for the Skagit Gorge plant, which at present has an output of 153,000 hp. With the additional appropriation of 1,000 sec.-ft. asked, the power production of this unit would be jumped to 196,875 hp., it is estimated.

For the newer Diablo Canyon project, for which permit No. 640 was issued in 1926, authorizing the use of 3,500 sec.-ft., an additional allowance of 700 sec.-ft. is asked. With this added flow it is declared that the present output of 120,000 hp. could be increased to 143,182 hp.

The applications state that these new requirements, to complete which two to three years would be required, would both be covered under the original estimates of $10,000,000 for the Skagit Gorge project and $8,000,000 for the Diablo unit.

## Safety of Electric Refrigerators

### Government Bureaus Explain Action of Refrigerants in Domestic Machines and the Small Hazard Attendant Upon Their Use

A JOINT statement to prevent "undue excitement" because of reported deaths due to mechanical ice boxes has been issued by the United States Public Health Service, the Bureau of Standards and the Bureau of Mines.

It was prompted by deaths which have occurred recently in Chicago and which, it was stated, "have been attributed to poisoning by methyl chloride which leaked from the refrigerating systems."

All refrigerating plants in practical use, it is explained, depend for their operation upon the "repeated gasification and condensation (sometimes by dissolving or absorbing in another substance) of a material which is technically called a 'refrigerant.'"

For many years gas ammonia was almost the only refrigerant used, but since then both sulphur dioxide and methyl chloride have come to be the most important of these refrigerants.

"None of the three refrigerants mentioned, ammonia, sulphur dioxide or methyl chloride, can be breathed with impunity," said the statement, "but none are violent poisons when breathed for a short time in low concentrations.

"If the same amount of the three substances is considered, methyl chloride is the least poisonous of the three, but because their physiological effects are quite different, it is hard to make a quantitative comparison.

"Sulphur dioxide and ammonia both have strong odors which are easily recognized and are so irritating that no one is likely to breathe much of them if escape is possible.

"Methyl chloride has a slight and rather pleasant odor, which probably would not awaken a sleeping person and might not be recognized by one who was awake.

"To this fact is to be attributed any greater hazard from methyl chloride than from other commonly used refrigerants."

Most of the trouble attributed to methyl chloride, said the statement, has occurred in connection with multiple refrigerating systems installed in apartment houses in which a single compressor delivers the refrigerant through tubes to the refrigerators in the several apartments.

"The high volatility of all practicable refrigerants makes it quite improbable that enough of these substances could be retained in food stored in the refrigerator to be harmful," the statement said.

## Electric Refrigeration

### *Government and Public Health Officials Propose National Code for Electric and Gas Refrigerator Industries*

PUBLIC health officials who have returned from Chicago, where they have been studying the situation with respect to recent asphyxiations from gas from refrigerators, have called a conference with other governmental agencies to outline recommendations for a national code for the electric and gas refrigerator industries. This conference will be attended by representatives of the Bureau of Standards, the Chemical Warfare Service and the Bureau of Mines, beside those from the Public Health Service. While no model ordinance will be drafted, recommendations probably will be made in this respect.

It is not believed to be a function of government to interfere in the situation by attempting to establish any particular series of rules and regulations in connection with refrigerator installations and inspections. This is especially the case when the refrigerator groups themselves have given every indication that they are alive to their responsibility, it is pointed out. At the same time, it is felt that experts from the various departments may be able to make suggestions that will benefit the industry in adopting a simplified national code.

In answer to the statement that per-

sons are overcome by illuminating gas from time to time without undue excitement being manifested, it has been observed that if illuminating gas lines were installed like some of the refrigerators, there would be a considerable increase in the deaths from asphyxiation.

In general, it is believed that ordinances should be prepared in such a way as to differentiate between unit and multiple-unit installations. No case of asphyxiation has been recorded from unit refrigerating devices, it is pointed out, and it is not believed necessary to subject these types of installations to the more stringent regulations that are needed for the multiple-unit type.

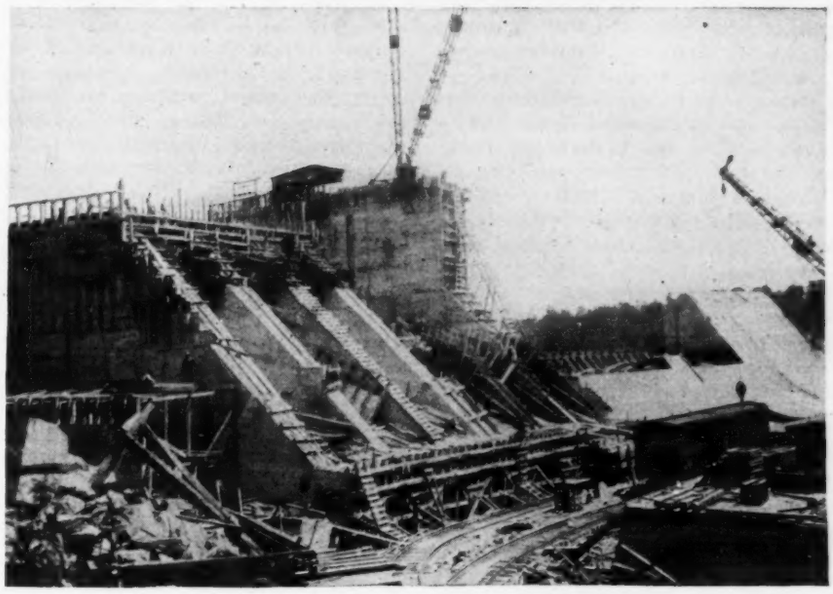
## Pacific Coast A.I.E.E. Convention Program

For the Pacific Coast convention of the American Institute of Electrical Engineers, to be held at Santa Monica, Calif., September 3-6, the tentative program includes two sessions of student section papers, on Tuesday afternoon, September 3, and Thursday morning. Members' technical papers will be presented Tuesday morning, Thursday afternoon and Friday morning and afternoon.

The members' papers will deal with radio interference from line insulators, spray and fog tests on 220-kv. insulators, 60-cycle flashover of long insulator strings, impulse insulation characteristics of wooden pole lines, development of insulating oils, effect of tank color on temperature of transformers under service conditions, population studies as an index to electrical development, flames from electric arcs, design features that make large turbo-generators possible, effect of surges on transformer windings, an underground alternating-current network system without network protectors, development of low-current, high-voltage fuses, neon-filled tubes and their characteristics, electrical control features of the wind tunnel at California Institute of Technology, sound pictures, the dial telephone system serving small communities in Southern California, parallel operation of transformers whose ratios of transformation are unequal, the relation of system connections and apparatus to stability and synchronous generation of voltage consumed by line inductance.

Trips will include one to the Long Beach steam plant of the Southern California Edison Company and its Lighthipe 220-kv. substation, the Seal Beach steam plant of the Los Angeles Gas & Electric Corporation, and the central and Wilmington receiving stations of the Los Angeles Bureau of Water and Power. A second trip will be made to the Los Angeles aqueduct hydro-electric plants, and a third trip will include the Southern Sierras Power Company's substation in San Bernardino and an inspection of the Hotpoint factory at Ontario. Ample recreational and sight-seeing features will be included.

## Alabama Power Pushes Lower Tallassee Plant



SHOWN above is a view of the Lower Tallassee Dam of the Alabama Power Company as it looked a few weeks ago, showing the gates and part of the spillway section. Its construction on the Tallapoosa River follows the reconstruction of the Upper Tallassee plant, finished about a year ago. These hydro plants have the advantage of the storage capacity of the Martin Dam.

## A.E.C. Committees Appointed and at Work

Announcement of the membership of committees of the American Engineering Council which will work with Congress and the federal administration in shaping public policies involving vast engineering operations has been made by Arthur W. Berresford of New York, president of the council. The committees are already at work and will report at an administrative board meeting which will be held in Washington next October.

D. Robert Yarnall, Philadelphia, has been appointed chairman of the public affairs committee. Mr. Yarnall is a representative on the council of the American Society of Mechanical Engineers. Public questions affecting engineers generally will come before this committee, the other members of which are J. L. Hamilton of St. Louis, John Lyle Harrington of Kansas City, H. A. Kidder of New York City, W. S. Lee of Charlotte, R. C. Marshall, Jr., of Chicago, R. F. Schuchardt of Philadelphia, Charles Penrose of Philadelphia, C. E. Skinner of East Pittsburgh, Max Toltz of St. Paul and Edwin F. Wendt of Washington.

A new committee on communications has been named to study proposed legislation for federal supervision of such means of communication as radio, telephone and telegraph. It will be headed by Edwin F. Wendt. Other members are O. H. Caldwell of New York, Dean Dexter S. Kimball of Cornell University, Frank A. Scott of Cleveland, Ohio, and Charles B. Hawley of Washington.

Chairmen of other committees of the council were announced as follows:

Flood Control—G. S. Williams, Ann Arbor, Mich.
Power—Farley Osgood, New York.
Reforestation—William Boss, University of Minnesota.
Recent Economic Changes—Dean Dexter S. Kimball, Cornell University.
Engineering and Allied Technical Professions—H. C. Morris, Washington.
Regional Activities—O. H. Koch, Dallas.
Program of Research—Dr. Harrison E. Howe, Washington.
Patents—Edwin J. Prindle, New York.
National Hydraulic Laboratory—Farley Osgood, New York.
Finance—John H. Finney, Washington.

## Power Survey for Middle West Division of N.E.L.A.

Prof. V. L. Hollister of the University of Nebraska engineering faculty has been engaged by the Middle West Division of the National Electric Light Association to supervise a power survey that a committee has been working for weeks to outline. The survey will cover all power plants in the four states composing the division—Iowa, Kansas, Nebraska and Missouri—and the results will be published in loose-leaf form so that in the years following the data can be kept up to date.

The plans have been materially changed from the first announcement, but the general purpose will be so to record the electric properties in the district that all member companies can get a picture of them in their entirety and in detail. Its principal value will be to enable a company to know the possibilities of interconnection in its vicinity. If it needs more power, the data at hand will help materially in solving the problem of whether it can get

energy more cheaply through interconnection than by generation. In addition to a directory of each town, the capacity output at peak load, the transmission-line capacity and the interconnecting points will be set down.

Thorne A. Browne, secretary for the division, who has assisted in the work, says that while other divisions have taken surveys, an entirely new idea is contained in this one which will give each operator complete facts from which he can draw his own conclusions and build his own plans. The data will be supplied by the companies. C. L. Kaar, Wichita, Kansas Gas & Electric Company, represents Kansas and is chairman; G. O. Brown, Kansas City Power & Light Company, Missouri; F. A. Beatty, Des Moines Electric Light Company, Iowa; F. E. Smith, Nebraska Power Company, Nebraska, with A. E. Bettis, Kansas City Power & Light Company, an ex-officio member.

# Holding Companies and Monopoly Laws

## Attorney-General of New York Rules that Anti-Monopoly Statutes Do Not Apply to Public Service Companies with State-Controlled Rates

ATTORNEY-GENERAL WARD of New York, in response to a request of Governor Roosevelt on the legality of the merger of numerous New York utility companies into the Niagara-Hudson Power Corporation, has reported that the power merger did not constitute a violation of any state law.

In his response to Governor Roosevelt, Attorney-General Ward said:

The anti-monopoly statutes of this state have been uniformly held to have no application to the public service corporation, whose rates are controlled by the state.

In this conclusion the state and federal courts have concurred with the quasi-judicial decisions of the Public Service Commission.

Mergers, notably that of the Consolidated Gas Company of New York with the Brooklyn Edison Company, have been approved by the Public Service Commission.

This latter merger was substantially a complete consolidation of all of the power companies operating in Greater New York, and involved a capital consolidation of more than twice as much as that involved in the Niagara-Hudson merger.

The Consolidated Gas Company merger, furthermore, virtually deprived Greater New York of any power competition, whereas competition exists in a large part of the territory in which the constituent companies of the Niagara-Hudson Company operate.

So far there has apparently been no swelling of fixed capital. The plan involves an exchange of stock and the total outstanding fixed capital of the Niagara-Hudson company is not only less than that of three underlying holding companies whose stock it acquired by exchange, but is also less than the fixed capital of the operating companies.

It is these operating companies which own the public franchises, and they present their rate schedules for the approval of the Public Service Commission.

Section 18 of the stock corporation law expressly permits such corporations to purchase the stock and bonds of other corporation. This is all that the Niagara-Hudson company has done or proposes to do so far.

I find no decisions in the courts of our state and no statute which declares such a thing to be unlawful. In fact, the Court of Appeals, in People ex rel New York Edison Company vs. Wilcox, 207 N. Y. 86, said:

"It is the settled policy of the State, arising through an extended and instructive experience, to withdraw the unrestricted right of competition between corporations occupying through special consents or franchises the public streets and supplying the public with their products or utilities which are well-nigh necessities."

When the Attorney-General has sought to restrain the actual consolidation of operating public service corporations as violating the anti-monopoly statutes, the applications have been uniformly denied by the courts on the ground that no unlawful monopoly could be created of a product supplied under a public franchise, the rates of which were determined by the state.

As Attorney-General I do not conceive it to be my duty here, nor have you asked me, to discuss any question of public policy, or to give you any personal opinion of the effectiveness of the statutes purporting to give the state control over its public service corporations, but since you have required my public opinion on the question of the violation of the anti-monopoly statutes, it is my duty to state the law as it exists, not as I or any one else would wish it to be.

I understand that needed amendments to the public service commission law are now under consideration by the commission recently authorized by Chapter 673 of the laws of 1929.

I shall be glad to aid them in any way they may request, particularly in framing an amendment giving the Public Service Commission suitable authority over companies holding public service securities.

## Poly-directional Beacons for Airways

Preliminary tests of a poly-directional beacon are being made in Detroit by the lighthouse division of the Airways Service with the expectation that the three-phase apparatus will be installed in Chicago and at other focal points as soon as satisfactory results are obtained. This unit will consist of three beacons operating on three separate frequencies and will be able to give directional broadcasts to three converging air lines.

The lighthouse division is also about ready to make its report on the surveys that it has been making for beacon installations between Washington and Pittsburgh and Miami and Jacksonville.

## Purchases and Mergers

The Public Service Commission has authorized the Union Electric Light & Power Company of St. Louis to purchase the property, franchise and all accompanying rights of the Missouri Hydro-Electric Power Company involved in the proposed construction of the power dam on the Osage River at Bagnell, Miller County. The company was authorized to pay $766,930.29 for the property and an additional $200,000 for preliminary services and promotion fees. The company was granted a certificate of convenience and necessity to construct, maintain and operate the hydro-electric development on the Osage River. It is estimated the project will cost approximately $30,000,000.

The Iowa Railway & Light Corporation of Cedar Rapids has completed contracts with 60 farmer-owners for purchase of the Salem-Gladbrook distribution system, which has been supplied by the utilities company the eight years it has been in use. Branch lines are to be constructed.

The Western Massachusetts Companies has acquired control of the Hampshire Electric Company of Becket, Mass., which buys energy from the Turners Falls Power & Electric Company and distributes it in Becket, Cummington, Chesterfield, Middlefield, Worthington and Plainfield. The Hampshire company is capitalized at $75,000 and has outstanding 1,500 shares of common stock of a par value of $50. Control was obtained by an exchange of stock, one share of Western Massachusetts being given for 1½ shares of Hampshire Electric.

The Iowa-Nebraska Light & Power Company has purchased the transmission line from Lincoln owned by the town of Hickman and has contracted to supply it at wholesale for ten years.

The Iowa Public Service Company, which for nine years has been supplying power to the Orange (Iowa) Electric Company, a farmer-owned utility, buying electricity wholesale from the Iowa Public Service and distributing it over a 17½-mile system to 31 customers, has purchased the distribution company. The utilities will spend $15,000 upon rebuilding the system and extending the lines south and east.

The municipal electric and water utilities of Oakland, Ore., have been acquired by the California-Oregon Power Company. The properties are located in the northern limits of the purchasing operator's Southern Oregon territory.

The Silver Creek Electric Company, Silver Creek, N. Y., has made application to the Public Service Commission for permission to transfer its distributing system to the New York State Electric Corporation. The Silver Creek Electric Company serves the communities of Silver Creek, Forestville, Hanover and Perrysburg, N. Y.

The Wilson Power & Light Company, owned by R. E. Lee Wilson of Wilson, Mississippi County, has acquired control and ownership of the Lepanto, Mississippi County, light plant, effective August 1. A branch line is to be built at once from Beasley, on the Wilson company's main line, to Lepanto, a distance of about 7 miles.

With the proposal given an almost unanimous approval by the voters, the Conway (Ark.) Corporation will hold a meeting for the purpose of formally taking over the municipal electric light and power plant under lease from the city for the period of a $200,000 bond issue, the proceeds from which will be distributed among educational institutions.

## Investigation of Georgia Public Utility Regulation

A resolution has been introduced in the Georgia Senate by Senator Felix Williams asking for the creation of a commission to investigate the regulation of public utilities in Georgia. The bill provides for a body of nine members, including the president of the state Senate and two senators designated by him, the speaker of the state House of Representatives and two representatives appointed by him and three citizens appointed by the Governor. The commission would be instructed to ascertain whether the public service laws in Georgia accomplish the purpose for which they are intended and what amendments would be advisable.

## Objects to Public Utility Commission for Texas

Criticism of Governor Dan Moody for his efforts to bring about the enactment of a law creating a public utilities commission was voiced by President R. B. Still of the Texas Independent Telephone Association, who claimed that a public utilities commission would cost the people of the state of Texas $2,500,000 a year.

"So far the only reason Governor Moody has advanced for a public utilities commission, Mr. Still said, is that the rates charged by the utilities are excessive. Our information is that the people of Texas are doing as well, in the matter of rates, as in those states where utility commissions are in operation.

"I can't say that we, as telephone men, would oppose any utilities commission bill," said Mr. Still; "neither are the people sufficiently informed to say that they would approve any measure along this line that might be introduced. The last state Democratic convention platform included a plan for providing for regulations of public utilities, such regulation to be placed in the hands of an existing agency.

"If I were to offer a solution, it would be that the Legislature appoint a fact-finding commission to determine whether a utilities commission could bring rates, rules, regulations and treatment accorded the public to a more just and equitable basis than the people of Texas get under existing laws."

## Knight Wants Commission Law Brought Up to Date

State Senator John Knight, in an interview at Albany, declared that the scope of the work of the commission to revise the New York public service commission law, of which investigating body he is head, will be to propose such amendments as will bring the law up to date to meet existing business conditions and to make it conform to court decisions. Assembling of many data will be necessary before the commission can actually get under way. From 1922 to 1929, inclusive, 191 separate amendments, not counting duplicate bills to the public service commission law, have been proposed, out of which 24 have received executive approval.

Few recommendations made by the commission itself in its annual reports to the Legislature have been acted upon. The Public Service Commission is one of the few departments that do not prepare their own suggested amendments to law and then lobby for them. It suggests what it believes should be done and then leaves the matter to the Legislature. It is perhaps for this reason that the law governing it has, in the opinion of many observers, become less and less adapted to meet changing conditions. Roughly speaking, there have been three classes of amendments proposed to the law—constructive, destructive, political. The constructive measures are few and far between.

## Wisconsin Defeats Government Ownership Program

The Wisconsin Senate defeated the entire government ownership program as passed in the Assembly and sponsored by the Wisconsin League of Municipalities. The joint resolution providing a constitutional amendment to permit the state to go into the power business was killed by a close vote. The bills providing for unrestricted competition by cities for unit accounting and for taxation at local rates were also killed.

In admitting defeat the leaders of the progressive and socialist faction acknowledged that the motive behind the dozen or more bills directed against utilities was state ownership. Heretofore, and particularly in the Assembly of the Wisconsin legislature, those favoring the bills have argued that the sole purpose of introducing them was to enable cities to enjoy the same rights which private companies now enjoy. The proponents of the bills vigorously denied that state ownership was the objective. The conservative leader in the Senate said that the conservatives welcomed the issue for the next campaign and would be glad to go to the people on a campaign against state ownership.

## Papers Listed for Tokyo

*Sectional Meeting of World Power Conference Draws Many Contributions from Europe and America—World Engineering Congress Interests General Electric Men*

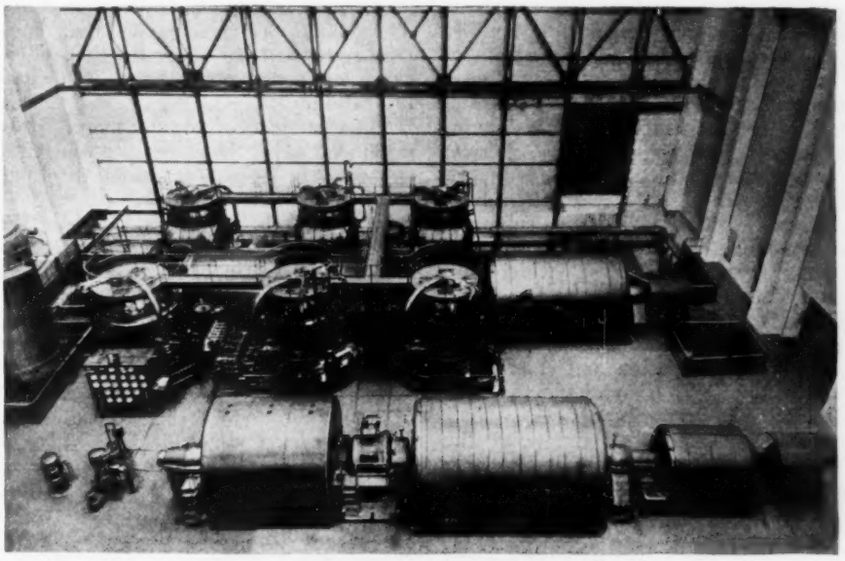
PAPERS for the Tokyo sectional meeting of the World Power Conference, which will be held in that Japanese city simultaneously with the World Engineering Congress to assemble there next October, had up to June 10 been received from foreign countries as follows: From Great Britain, 11; the United States, 14; Germany, 11; Czechoslovakia, 1; Switzerland, 7; Denmark, 4; Sweden, 14; Italy, 1; Russia, 5. From Japan itself 50 papers had been listed, covering six sections of the conference.

The American papers entered up to the date named as given out by those arranging the sectional meeting were:

"Economic Results of Railway Electrification," A. I. Totten, General Electric Company.

"Large Power Transformers—Some Eco-

## Crawford Avenue's 104,000-Kw. Turbo-Generator



CAPACITY of the Commonwealth Edison Company's Crawford Avenue generating station in Chicago has been increased by the recent installation of a 104,000-kw. tandem cross-compound turbo-generator unit with vertical condensers. The new machine, the design of which is brought out above, is the product of the Westinghouse Electric & Manufacturing Company.

nomic Aspects Affecting Their Design," F. F. Brand and H. O. Stephens, General Electric Company.

"General Trend of Steam Turbine Development," Ernest L. Robinson, General Electric Company.

"Some Phase of Ship Propulsion as Influenced by Modern Power-Plant Engineering," R. A. Beekman and A. Kennedy, Jr., General Electric Company.

"High Pressures and High Temperatures in Power Generation," George A. Orrok, New York.

"Electric Line Extension in Rural Communities," Wellington Rupp, Olympia, Wash.

"American Power-Station Electrical Equipment," —— Newbury.

"Electrical Energy Produced Thermally," —— Bushnell.

"Frequency and Voltage," R. E. Argersinger, Stone & Webster.

"Control and Supervision of Electricity," H. B. Sawyer.

"Operation of Turbo-Generators by Total Temperature Instead of Temperature Rise," W. J. Foster, P. Torchia and —— Newbury.

"Recent Progress in Combustion Engineering," Combustion Engineering Corporation.

"Present Status of Public Utility Regulation in the United States of America," W. H. Blood, Jr.

"The Thermal Electric Plants," Frank S. Clark, Stone & Webster.

It is announced from Schenectady by the General Electric Company that the principal paper by a General Electric man to be delivered before the power conference will be that of E. Wilbur Rice, Jr., honorary chairman of the board of directors, who will discuss "Recent Economic Developments of Electric Power."

The electrical papers listed from other nations than the United States cover a wide range of topics ranging from practical considerations of machinery construction, smoke abatement, interconnection, inductive co-ordination, pulverized fuel, Diesel engines and so forth to more unusual topics such as the utilization of tides and of terrestrial heat for generating power.

Papers to be presented by General Electric Company men at the World Engineering Congress in Tokyo are announced by that company as follows:

"Industrial Progress Made Through Research and Its Economic Importance," Dr. Willis R. Whitney, vice-president and director of research.

"The Emmet Mercury Vapor Process, Results Accomplished," by William L. R. Emmet, consulting engineer.

"Rolled Steel in the Construction of Electrical Machines," by H. G. Reist, engineer, alternating-current engineering department.

"Lightning," by F. W. Peek, Jr., engineer, transformer engineering department.

"Remote-Operating Supervision and Control of Electric Power Stations and Substations in the United States," joint paper by Chester Lichtenberg, switchgear engineering department, and Ferdinand Zogbaum, assistant engineer New York Edison Company.

# Berlin World Power Conference in 1930

## Second Plenary Meeting Will Be Held from June 16 to 25—Distribution and Utilization of Power to Have Precedence Over Technical and Engineering Topics

SIX years after the notable World Power Conference held at London in 1924, the second plenary meeting of this international body will take place in Berlin from June 16 to June 25, 1930. Berlin was selected as the meeting place by unanimous resolution of the 47 member nations of the conference, and the meeting will bring together many of the most prominent authorities on power and fuel from all over the world. Dr. Gerhard Dehne is acting for the managing organization at Berlin. O. C. Merrill of Washington is general chairman of the American committee, and all communications relating to the conference should be addressed to him. All papers submitted from the United States must go through the American committee, which will forward them to Berlin, the latest date for their receipt there being November 1 of this year.

Copious information and counsel has been printed and is available for those thinking of preparing papers. This information emphasizes the point that the conference of 1930 will deal principally with the distribution and utilization of power and that economic considerations rather than technical and engineering questions will be emphasized, technical questions being of interest only in so far as they concern the most recent progress.

"In the wide field of electrical generation," this statement says, "an international discussion would be of the greatest interest regarding the considerations that are at present decisive in the questions of selection and subdivision of generating plant in large central stations. In connection with this the problem of the storage of electrical energy and provision for peak loads deserves special consideration." The many electrical topics that have been suggested fall under the three divisions of generation, distribution and utilization.

"The subject of water power," the statement says, "was dealt with fairly exhaustively at the sectional meetings at Basle in 1926 and Barcelona in 1929. It will thus be advisable to limit the choice of subjects at the plenary conference in 1930 in order to avoid repetition and to direct attention particularly to recent progress and advances. Nevertheless, the utilization of water power in general plays such an important part in most countries in the whole question of power economics that the advances made in various directions should be set out systematically. It will be of advantage to class these advances under the following principal headings: Developments in regard to economy; extension and utilization of water power; progress in matters of water-power storage; new developments in the construction of water turbines and pumps, and experience and progress in matters of water economy."

## Power Pact Between Dominion and Provinces Probable

The Canadian government is now sending communications to the Provinces of Ontario and Quebec with regard to the power situation in eastern Canada. It is hoped to arrange by mutual agreement for a determination of points which argument before the Supreme Court of Canada last fall failed to clear up. The questions then submitted, it will be remembered, concerned the relative rights of the Dominion and the provinces respecting powers on navigable waterways. Several of the questions were not answered as being abstract rather than concrete. In some the contention of the provinces was maintained.

The trend of events meanwhile suggests an ultimate agreement, since the provinces, owning the beds of streams, have the fundamental ownership of water which runs over them. This has not always been conceded, but last winter, in the prolonged consideration given to the Beauharnois project, the point came up and the contention of provincial ownership was not seriously questioned. The Dominion government, however, exercises a paramount authority over navigation and there are some points to be settled in regard to it. For example, if the Dominion government constructs works to improve navigation and surplus power results therefrom, the Dominion claims ownership of that power regardless of the fact that generally the water is vested in the province. No great difficulty is foreseen in coming to an agreement which mainly concerns the two central provinces, although the other provinces are interested and may participate in the conferences to take place early in the fall.

## St. Lawrence Waterway Project Considered Unsound

The Institute of Economics of the Brookings Institution, Washington, after subjecting the economic and commercial phases of the St. Lawrence navigation and power project to a most comprehensive examination, concludes that the project, viewed from all angles and from the standpoint of the shipper, shipowner, taxpayer and public, is not economically desirable or feasible.

The costs are estimated to be roughly one thousand million dollars, of which $614,000,000 are assignable to navigation and $385,000,000 to power development. Annual overhead charges assignable to navigation are estimated at $36,000,000, and relating traffic to annual overhead charges, the cost per ton of traffic is said to exceed the likely saving in transportation charges.

The power phases of the project are treated at length in a report especially prepared by the engineering firm of Sanderson & Porter. The Institute of Economics finds that the price at which such power could be sold would not

yield a return sufficient to compensate for all the costs incurred in its generation and distribution.

While the development of St. Lawrence hydro-electric energy will doubtless in the course of time be economically profitable, the Institute of Economics is of the opinion that its exploitation at present would be premature.

## No Action on Niagara Treaty Until December

Denying that Chicago interests alone are responsible for the delay in Senate ratification of the Niagara remedial works treaty, Senator Borah said that the foreign relations committee will consider no controversial subjects until Congress meets in its regular session in December.

Interests from Michigan, Minnesota and Wisconsin have requested the committee to grant them a hearing before it approves the treaty, Senator Borah said. When reminded that the engineers' report brought out that only a small amount if any additional water would be drawn from the basins of the upper lakes by reason of the construction of the submerged wiers, he expressed the opinion that this technical report is far from conclusive.

The main reason for the delay is said to be due to the determination on the part of some of the lakes states interests not to lose what may prove to be a good trading point with Canada. Under this policy, no settlement would be made with Canada affecting the boundary waterways until the whole subject of Great Lakes outlets and diversions is taken up.

## Lakes States Oppose Lakes-to-Gulf Waterway

Declaring their opposition to the plan of the Sanitary District of Chicago for improving the Illinois River as a waterway, a delegation of the attorneys-general of Minnesota, Wisconsin, Michigan, Ohio, Pennsylvania and New York called upon President Hoover July 25 to urge him not to approve any plan for the development of the lakes-to-the-gulf waterway in contravention of the decision of the U. S. Supreme Court in the Chicago drainage case.

The delegation represented that any diversion of water from the Great Lakes in excess of 1,000 cu.ft. per second would impose a wholly unnecessary burden upon lake-borne commerce.

If diversion is authorized at all, navigation should be the object sought, the attorneys-general represented, contending that the interest of the Sanitary District is not primarily in navigation, but in profit from the power developed.

It was stated that the proposed waterway of the state of Illinois is expected to yield an annual profit of $2,000,000 from water power, while the Chicago Sanitary District would make an additional annual profit of $1,000,000.

# Briefer News

WATERTOWN, S. D., ENLARGES ITS PLANT.—An addition to the municipal electric plant at Watertown, S. D., is under way. When completed the plant will house approximately $120,000 worth of equipment, doubling its capacity, according to Jesse Olson, city light superintendent.

GOLDEN CROWN FOR A SKYSCRAPER.—An outstanding feature of the recently completed Chanin Building in New York City is the floodlighted crown of the tower. The illumination of this

section makes that portion of the exterior which is above the fifty-second floor a part of the decorative scheme by night as well as by day. The tower was designed for night illumination. The exterior space produced by the setback of the fifty-third floor is broken by a series of terra-cotta buttresses, ten on the wide sides of the building and three on the narrow sides. These buttresses are pierced so as to form a sheltered promenade, reached through French doors from the fifty-fourth floor. While clearly visible by day the buttresses are concealed at night, while the spaces between and behind the arches, not seen in the daylight, are brought into view. This effect is produced by the use of three distinct lighting systems of Westinghouse design and manufacture. One hundred and fifty-six floodlamps are arranged in batteries of three in two series of bays surrounding the fifty-second and fifty-third floors. These are responsible for the principal illumination of the buttresses and promenade. Twenty-eight more projectors, seven at each corner, throw their rays so as to illuminate the corners of the tower. These rays pass the building and converge upon the tops of the flagpole approximately 755 ft. above street level, making possible the night illumination of a flag or pennant.

REBUILDING A WISCONSIN DAM.—Work of rebuilding the Jersey dam of the Wisconsin Valley Electric Company, near Tomahawk, Wis., was started on July 12 and is scheduled for completion about November 1. The old rock-filled, wood-cribbed dam which is being replaced was built under legislative act in 1887. The new dam will be 152 ft. long and will connect with the hydro-electric power station.

SYRACUSE TEXTILE PLANT ELECTRIFIED.—Operation of the plant of the Waterloo Textile Corporation at Syracuse, N. Y., on day and night shifts has been made possible economically by substitution of electricity for steam as power. There are 104 electric motors throughout the mill, ranging in size from 100 hp. down to 0.25 hp. Installation of two more motors will complete electrification.

ELECTROCHEMISTS TO DISCUSS AVIATION MATERIALS. — The American Electrochemical Society will hold its fall convention in Pittsburgh on September 19-21, when it will discuss, among other subjects, the contributions of the American electrochemical industry to aeronautics, with emphasis given to the light-weight aluminum and magnesium alloys used in airplane construction.

ELECTRAGISTS PLAN PROGRAM FOR FALL CONVENTION.—With four business sessions and a varied sightseeing program scheduled, the Association of Electragists International has prepared a comprehensive program for its annual convention, which will be held this year at the New Ocean House, Swampscott, Mass., September 30 to October 3, inclusive. On the mornings of October 1 to 3, inclusive, business sessions for contractors and dealers only will be held, and on the afternoon of the third there will be a general session for the entire industry. The other afternoons will be occupied by trips to points of engineering, historic and scenic interest in eastern Massachusetts.

PROFESSORS ATTEND CONFERENCE CONDUCTED BY GENERAL ELECTRIC COMPANY.—Twenty-four professors of engineering in as many colleges and universities are attending the five-weeks professors' conference conducted this year, as in previous years, by the General Electric Company. The conference opened at Schenectady on July 1 and will continue through August 3. During that period the visitors have the opportunity to study developments in

electrical and mechanical engineering in industrial plants. On July 11 they journeyed to Pittsfield, Mass., to inspect transformer work at the General Electric plant there. July 12 and 13 were passed at the River works and West Lynn works of the company at Lynn, Mass.

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OSWEGO, N. Y., SEEKS RIGHTS IN RIVER FLOW.—Governor Roosevelt has promised the officials of Oswego, N. Y., a conference on the matter of the city acquiring the surplus flow of water on the east half of the Oswego River at Dam 6. Efforts in this direction last year failed. The city power plant, operated and leased by the Oswego River Power Corporation, develops 7,500 hp. from the west half of the river's flow.

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MAKING TESTS FOR THE MOUNT MORRIS DAM ON GENESEE RIVER.—Tests embodying the conditions which will confront the proposed Mount Morris dam in the Genesee Valley are, in accordance with a recent forecast, being applied to a model of the dam set up at Station 25 of the Rochester Gas & Electric Corporation, just above the Middle Falls, where they will continue for several weeks. The model represents a section of the overflow structure of the dam. The latter, according to recent figures, will be 1,100 ft. long at the top and 690 ft. at the base, 175 ft. thick at the base and 21 ft. at the top, with a maximum height of 230 ft.

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BRITISH COLLIERY TO FOSTER ELECTRICAL DEVELOPMENT. — Arrangements have been completed for the treatment of part of the output of Tilmanstone Colliery, one of the largest mines in the Kent coal field, in England, by a process of low-temperature carbonization. The directors of the colliery have been advised on high authority that electricity can be generated in the Kent coal field cheaper than at any other place in the United Kingdom, and it is proposed ultimately to erect a generating station at or near Dover or at the colliery capable of producing from 100,000 kw. to 200,000 kw. and to create industries requiring a constant supply of electricity for their processes. It is estimated that more than a billion tons of coal lie in the area controlled by this colliery.

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WESTERN SECTION OF INTERNATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. — Meeting at the Book-Cadillac Hotel, Detroit, on August 26-28, for its twenty-fifth annual convention, the Western Section of the International Association of Electrical Inspectors will, in addition to the numerous reports of officers and committees, listen to addresses on meter service entrance breakers by H. G. Nichols of the Westinghouse company; on the bare grounded neutral, by A. N. Meier of Evansville, Ind., and Dr. M. G. Lloyd of the Bureau of Standards; on small-town grounding problems, by George Welman, New Orleans; on the international association, by President J. C. Forsyth, and on the relations between the contractor and the inspector, by Thomas Templeton, Detroit. Other speakers are still to be announced. The solution of flexible-cord problems will be discussed by C. W. Abbott, R. C. Shepard and J. C. Forsyth of New York and L. L. Johnson and Arthur P. Good of Chicago.

## *Coming Meetings*

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see issue of July 6, page 46.]

Camp Co-operation IX—Association Island, Henderson Harbor, N. Y., Aug. 2-6. Society for Electrical Development, 600 Graybar Bldg., 420 Lexington Ave., New York.

International Association of Municipal Electricians—Statler Hotel, Boston, Aug. 20-24. H. N. Lang, box 1864, Orlando, Fla.

International Association of Electrical Inspectors, Western Section—Book-Cadillac Hotel, Detroit, Aug. 26-28. W. S. Boyd, 175 W. Jackson Blvd., Chicago. International convention, Vancouver, B. C., Canada, Sept. 9-11. F. D. Weber, P.O. box 745, Portland, Ore.

National Association of Railroad and Utilities Commissioners—Glacier National Park, Mont., Aug. 27-30. J. B. Walker, 270 Madison Ave., New York.

Rocky Mountain Division, N.E.L.A.—Hotel Colorado, Glenwood Springs, Colo., Sept. 2-4. O. A. Weller, Public Service Co. of Colorado, Denver.

Colorado Utilities Association—Glenwood Springs, Colo., Sept. 2-4. O. A. Weller, Public Service Co. of Colorado, Denver.

American Institute of Electrical Engineers — Pacific Coast convention, Santa Monica, Calif., Sept. 3-6. F. L. Hutchinson, 33 West 39th St., New York.

Pennsylvania Electric Association—Bedford Springs Hotel, Bedford Springs, Pa., Sept. 4-6. H. A. Buch, Telegraph Building, Harrisburg, Pa.

Association of Edison Illuminating Companies—Chateau Frontenac, Quebec, Sept. 9-12. P. S. Millar, 80th St. and East End Ave., New York.

New England Division, N.E.L.A. — Hotel Griswold, New London, Conn., Sept. 9-12. Miss O. A. Bursiel, 20 Providence St., Boston.

Empire State Gas and Electric Association—Saranac Inn, Saranac Lake, N. Y., Sept. 19-20. C. H. B. Chapin, Grand Central Terminal, New York.

American Electrochemical Society — Hotel William Penn, Pittsburgh, Sept. 19-21. C. G. Fink, Columbia University, New York.

Illuminating Engineering Society — Bellevue-Stratford, Philadelphia, Sept. 24-27. A. B. Oday, 29 West 39th St., New York.

Great Lakes Division, N.E.L.A. — French Lick Springs, Ind., Sept. 26-28. T. C. Polk, room 110, 140 South Dearborn St., Chicago.

American Electric Railway Association —Atlantic City, Sept. 30-Oct. 4. J. W. Welsh, 292 Madison Ave., New York.

Association of Electragists International—New Ocean House, Swampscott, Mass., Sept. 30-Oct. 3. L. W. Davis, 420 Lexington Ave., New York.

National Safety Council — Stevens Hotel, Chicago, Sept. 30-Oct. 4. W. H. Cameron, 108 East Ohio St., Chicago.

National Electrical Manufacturers' Association—Wardman Park Hotel, Washington, Oct. 7-11. S. N. Clarkson, 420 Lexington Ave., New York.

ELECTRICITY TO GENERATE STEAM AT HAWKESBURY (ONTARIO) PULP MILLS. —The Canadian Hydro-Electric Corporation, Limited, has commenced the construction at Hawkesbury, Ontario, of a transformer station to cost in the neighborhood of $200,000 which will operate at a capacity exceeding 40,000 hp. and will be used to supply power to the Hawkesbury pulp mills of the Canadian International Paper Company. A feature of this development is that boilers are being installed in the company's mills for the generation of steam by electricity, as a secondary load. The electric boiler installation is expected to come into operation about October of this year. The new installation will consist of three 13,300-kva. transformers.

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WATER-POWER RESOURCES OF THE MCKENZIE RIVER BASIN, OREGON.—The water-power resources of the McKenzie River Basin amount to 442,000 hp. for 50 per cent of the time and 289,000 hp. for 90 per cent of the time, according to recent investigations for the Geological Survey. The developed power comprises only the Eugene municipal plant of 4,300 hp. A second plant near Leaburg which is being built by that city is nearing completion and will have an initial capacity of 10,000 hp. and an ultimate capacity of 20,000 hp. It is estimated that if all the sites in the McKenzie River Basin were developed and interconnected with a large power system, with steam standby to carry the load in dry seasons, the total usable power would equal twice the present requirements of the State of Oregon.

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TECHNICAL MEN TO AID CHICAGO'S COMING EXPOSITION. — Formation by the National Research Council of a special committee of scientists from all sections of the United States and covering every field of pure and applied science to serve as an advisory body with the trustees of the "Century of Progress," Chicago's international exposition to be held in 1933, is announced. Executive members of this committee are Dr. Frank B. Jewett, chairman, New York; Gano Dunn, New York; Prof. M. I. Pupin, New York; Dr. William Allen Pusey, Chicago; Dr. George K. Burgess, Washington; Dr. Vernon Kellogg, Washington, and Dr. Max Mason, New York.

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BRITISH COLUMBIA'S WATER-POWER RESERVES. — British Columbia's vast water powers will be made the subject of systematic survey during the next few years, not only in districts tributary to cities but in remote regions, according to the official utterance of the Minister of Lands, who added that "the suitability of a hydro-electric commission similar to the one in Ontario to conditions in British Columbia will require careful and intensive study." In this connection it is reported that a party of engineers representing the

International Paper & Power Company of New York is at present conducting final surveys in the northern end of Vancouver Island for the establishment of a 500-ton paper mill. Power will be obtained by damming Nimpkish Lake. It is estimated that the plant will entail an expenditure of close on $20,000,000 capital to cover timber limits, erection of the plant and power development.

I. E. S. TO CONVENE IN PHILADELPHIA IN SEPTEMBER.—The twenty-third annual convention of the Illuminating Engineering Society is to be held at the Bellevue-Stratford Hotel, Philadelphia, from September 24 to 27 inclusive. Papers to be presented will constitute a summary of the progress made in lighting during the past year. One entire session of the meeting will be devoted to the observance of "Light's Golden Jubilee." There will also be a session for central-station lighting service engineers, another devoted to natural lighting, and others featuring laboratory, lighting practice and technical subjects.

ESTABLISHING THOUSANDS OF MILES OF 24-HOUR AIRWAYS. — Additional thousands of miles of 24-hour airways to facilitate flying are to be put in service by the United States Department of Commerce, which is to install 400 additional airway beacons at intervals of 10 miles each along the new light routes. The 24-in. beacons, each of 2,000,000 cp., rotate six times per minute. Each tower is equipped with two course lights in addition to the beacon, the lights pointing in the direction of the airway and flashing in code to indicate the number of the beacon along its particular route. The new beacons, which are being supplied by the General Electric Company, employ spherical mirrors rather than louvers to control the stray light. The flashing devices for the course lights are Cooper Hewitt "Konnectors" instead of the mechanical and magnetic contactors previously used.

LOWER NISQUALLY RIVER ENTERPRISE GETS STATE PERMIT.—The first Lower Nisqually River power development has just been authorized by the state hydraulics supervisor of Washington, who has issued permits to the Pacific Development Company of Olympia, which contemplates the construction of a plant to cost $1,500,000. The point of diversion, 3 miles east of the prairie town of McKenna, 30 miles from Olympia, is less than 20 miles from the confluence of the river with Puget Sound. No storage reservoirs would be necessary for this enterprise, which would operate with the use of a 230-ft. concrete diversion dam 4 ft. high, this dam serving to send the water into a 9.61-mile canal leading to the power plant. Lars Langloe of Olympia, president of the concern, said that the plant as now contemplated would have an output of 26,820 hp.

# Recent Court Decisions

EVIDENCE TENDING TO SHOW NEGLIGENCE BY COMPANY NOT A WAIVER OF "RES IPSA LOQUITUR" DOCTRINE.—Injury from contact with a fallen electric wire brought a damage suit (Waldsmith vs. Union Gas & Electric Company) in which alleged negligence by the company was the subject of testimony although the doctrine of *res ipsa loquitur* ("the thing speaks for itself") was also set up. The Court of Appeals of Ohio, sustaining a judgment for the defendant on condition that the amount of damages imposed be reduced, said that the attempt to prove negligence on the part of the defendant did not constitute a waiver of the doctrine alluded to. The case, it held, was properly submitted to the jury. The court also stated that the franchise ordinance of a city prescribing the duties of an electric light company in respect to its plant is not conclusive as affecting a pedestrian in an action brought by the latter against the company for damages. (166 N. E. 588.)

INSTALLED RANGE NOT A PART OF THE REALTY SUBJECT TO MORTGAGE LIEN.—Reversing the judgment of the lower court, the Kentucky Court of Appeals held in Gas & Electric Shop vs. Corey-Scheffel Lumber Company that, since the plaintiff had an agreement with a certain purchaser that it might remove a range if default on payment were made, the range did not become a part of the realty to such an extent that mortgage liens attached to it, inasmuch as it was possible to remove it without damaging the range itself or the freehold. (13 S. W. [2d] 1009.)

RIGHT OF ELECTRIC COMPANY TO STRING WIRES ON HIGHWAY CEASES IF STATE CLOSES THE ROAD.—When the state in the exercise of its police power closes a road for the benefit of the public, said the New York Supreme Court, Appellate Division, in New York Central Railroad Company vs. Westchester Lighting Company, the right of an electric light company to string its wires where the road had been is brought to an end. A different conclusion might be reached concerning strips of land adjoining the railroad's right-of-way and conveyed to the lighting company, but the defendant could not use these alone, and it was without the right to maintain wires on the closed highway. (235 N. Y. S. 27.)

USING FIXTURES FORBIDDEN BY NATIONAL ELECTRIC CODE IS EVIDENCE OF NEGLIGENCE.—McIntosh vs. Alabama Power Company was a suit for damages because of the death of an employee of a floor-cleaning contractor, death being caused by the ignition of gasoline used in the cleaning process owing to an electric arc coming from a floor plate installed to permit the operation of electrical appliances. The question of the negligence of the company, in whose office building at Montgomery the fatality occurred, hinged on whether the floor connection was a safe one and the accident due to failure properly to remove the plug by the workmen or whether the connection was sub-standard and the safety of the workmen neglected by the company, which was said to have authorized the use of the gasoline. In affirming judgment for the plaintiff the Supreme Court of Alabama dwelt on the point that the floor connection was not of the type approved in the National Electrical Code and said that the use of connections disapproved in the code constituted negligence in itself. (122 So. 677.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

# Commission Rulings

INDIANA CUSTOMERS MAY CHOOSE SYSTEM OF BILLING.—After almost two years of a system involving the double billing of its electric customers, the Northern Indiana Power Company has obtained permission from the Indiana Public Service Commission to give its customers a choice of which billing is to be sent to them in the future, thus eliminating much clerical work. The company asked permission to introduce the "active-room rate," system in Huntington, Ind., and for a trial of three months or more to convince householders that electricity was cheaper under that classification. The time had been extended from time to time, with the company sending out two bills for electricity, one under the old block rate and another under the active-room rate, allowing the customer to pay whichever he crose.

COMMISSION REFUSES TO DIRECT COMPANY TO PRODUCE COPIES OF ITS INCOME TAX REPORTS.—The New Jersey Board of Public Utility Commissioners has refused a petition from the city of Passaic that it issue a subpoena directing the Public Service Electric & Gas Company to produce copies of its income tax reports. The commission said that such copies, if produced, would not be the best evidence and would not be admissible over the objection of the utility in view of the original return having already been filed with the federal government. The proper procedure, it said, to obtain access to the income tax returns filed with the United States government by a utility is to have the Governor of the state apply to the proper officers of the United States government under the rules and regulations prescribed by the Secretary of the Treasury and approved by the President.

UTILITY PURCHASE PRICES AND SERVICE RATES.—The Missouri Public Service Commission has authorized the American Utilities Service Company, a Delaware corporation, to acquire control of the capital stock of the Lexington (Mo.) Water Company and the Independence (Mo.) Water Works Company, although holding that the price for the stock in each instance was excessive. The commission ruled that if the buyer desired to pay an excessive price for the stock, that was his own concern, but served notice in the order that "such prices could not and will not be used against the public as a basis for rates to be charged or for issuance of securities." The commission ruled that the approval of the purchase would not in any way be construed as recognition of the purchase price as the value of the property, and that rates or security issues must be based upon the fair value of the property and not the stock purchase price.

# News About Men of the Industry

## *Alex D. Bailey New Head Engineering National Section*

Alex D. Bailey, who was recently appointed chairman of the Engineering National Section of the National Electric Light Association, as announced in the July 20 issue of ELECTRICAL WORLD, has been active in engineering circles for a number of years.

Practically his entire career in the public utility field has been spent with the Commonwealth Edison Company, though he had some preliminary experience with the Evanston Heating Company. It was in 1903 that he entered the employ of the Chicago Edison Company, a predecessor of the Commonwealth Edison Company, as mechanical engineer at the Harrison Street station. After three years at Harrison Street station he was transferred to the engineering department of the company, where he spent the next two years planning general engineering work. In 1906 he was sent to the Fisk Street station as assistant chief engineer, and later became chief engineer of this station. He has been superintendent of generating stations of the Commonwealth Edison Company since 1921. Mr. Bailey has contributed numerous articles of interest to the technical press and has been active in committee work, having served as counsellor of the prime movers committee of the National Electric Light Association, as a member of the main research committee of the American Society of Mechanical Engineers and on numerous committees for the Commonwealth Edison Company.

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ROBERT P. BURROWS, formerly assistant manager of the Sunbeam lamp division of the National Lamp Works of the General Electric Company, with headquarters in San Francisco, has been appointed general manager for the Pacific division of the National Lamp Works with headquarters in Oakland, Calif. He succeeds A. M. Sweeney, who has gone to Nela Park, Cleveland, to become assistant to Mr. McKittrick, general manager of the National division of the Edison Lamp Company.

FRED N. WARDWELL, formerly assistant engineer of the New York Central Lines, has joined the Rome Wire Company, Division of General Cable Corporation, as railroad sales engineer, with headquarters at Rome, N. Y. Mr. Wardwell has had wide railroad experience. During the past eleven years with the New York Central he has been closely identified with the electrification and equipment projects of its lines, having had direct supervision of the material inspection bureau of the electrical department. He was also technical adviser to the purchasing and stores departments.

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## *Frank B. Steele Resigns*

Frank B. Steele has resigned as vice-president and general manager of the Utica Gas & Electric Company, Utica, N. Y., effective immediately. Mr. Steele had been connected with the company since 1918, when he transferred his interests to the East from Dayton, Ohio. It was four years ago that he was appointed vice-president and general manager. A graduate of the George Washington University, Washington, D. C., Mr. Steele entered the service of the Westinghouse Electric & Manufacturing Company. Subsequently he went to Dayton, Ohio, where he spent 5½ years as power engineer of the Dayton Power & Light Company.

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## *Harry Reid Appointed Chairman Public Relations Section*

Harry Reid, who was appointed chairman of the Public Relations National Section of the National Electric Light Association, as announced in the July 20 issue of the ELECTRICAL WORLD, has been president of the National Electric Power Company for the past two years. Though Mr. Reid is a native of New York and first entered the electrical industry with the Fulton County Gas & Electric Company in that state, he spent many years with the Insull interests in Kentucky and the Middle West. After establishing himself in Kentucky he became interested in syndicating a number of public utility companies in central Kentucky and later he became vice-president and general manager for the Kentucky Utilities Company, which was organized by the Insulls. In 1913 he was elected president and in 1917 he was selected for the presidency of the Interstate Public Service Company. Mr. Reid has by no means confined his attention to National Electric Light Association activities, but on the contrary has taken part in the affairs of the American Institute of Electrical Engineers, the American Electric Railway Association and the National Institute of Social Sciences.

## *F. P. Cummings Elected to New Executive Position*

F. P. Cummings, who has been actively identified with public utility operations in the South and East, has been elected a vice-president of the Commonwealth & Southern Corporation. At the present time Mr. Cummings is also a vice-president of the Southeastern Power & Light Company, having been elected to that office three years ago, after long connection with the Alabama Power Company. He is also president of the South Carolina Power Company and vice-president of the Alabama Power Company and Georgia Power Company. A graduate of the Clarkson College of Technology at Potsdam, N. Y., he commenced his practical education in the Pittsfield works of the General Electric Company. He then entered the employ of Henry L. Doherty & Company, serving with the properties in Denver, with the Colorado Power Company and with the Montgomery Light & Water Power Company. In 1913 he was transferred to Joplin, Mo., as sales manager for the Empire District Electric Company, and from this position he went to Alabama. With the Alabama Power Company he occupied successively the positions of operating superintendent, commercial manager and vice-president.

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## *H. G. Taylor Made Manager of Lawrence Company*

Horace G. Taylor, chief engineer of the Lawrence (Mass.) Gas & Electric Company, has been appointed manager of this utility. LEROY S. COLBY, for many years superintendent of the electrical department, has been appointed assistant to the president and to the manager.

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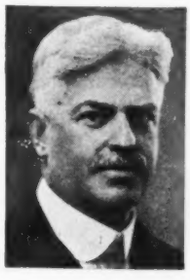
H. S. MORSE, general manager of the Indianapolis Water Company, was elected president of the Indiana Public Utilities Association for the ensuing year at a recent meeting of the board of governors. THOMAS F. ENGLISH, general manager of the Indiana & Michigan Electric Company, South Bend, was elected vice-president.

A. G. BUTLER, general superintendent of construction for the Louisville Gas & Electric Company, has been promoted to manager of the Pittsburgh branch of the construction department of the Byllesby Engineering & Management Corporation, Chicago. He succeeds W. G. Jens, who has been appointed operating manager of the Duquesne Light Company, Pittsburgh. Mr. Butler has been in charge of the Louisville company's construction department since 1918 and recently completed construc-

tion of the 80,000-kw. hydro-electric station at the Falls of the Ohio River. For three years previous to his Louisville connection he was with the Pennsylvania Railroad Company. He is a graduate of Rose Polytechnic Institute, Terra Haute, Ind. Mr. Butler will be succeeded by G. R. ARMSTRONG, who has been assistant superintendent of construction since 1922. Mr. Armstrong also is a graduate of Rose Polytechnic Institute and both men are natives of Terre Haute. Mr. Butler superintended construction of U. S. Government Dam No. 41 at Louisville for the Byllesby company, a gas manufacturing plant, and additions to a steam-generating station for the Louisville company.

## *C. E. Eveleth Transferred to Engineering Department*

Charles E. Eveleth, who since 1927 has been a vice-president of the General Electric Company, associated with C. C. Chesney and W. R. Burrows in the management of the manufacturing department of the company, has been transferred to the engineering department, and as vice-president will be associated with E. W. Allen in the direction of that department's affairs. This announcement was made by President Gerard Swope, who explained the change was made "because of the increase in the work of the engineering department due to the rapid growth in the volume and in the complexity of the company's business."



Mr. Eveleth will give special attention to the problems of the designing departments and works laboratories. Mr. Allen will direct his attention to the work of the commercial engineering, the contract service and district engineering departments. Mr. Eveleth has been in the employ of the General Electric Company since 1899. In September, 1922, he was named assistant manager of the Schenectady works and on January 1, 1923, was appointed works manager, a position he held until elevated to the vice-presidency four years later.

M. J. RAILING, who is to become joint managing director of the General Electric Company in London with Sir Hugo Hirst, has played no inconsiderable part in building its fortunes. He has been associated with the company for more than 38 years and has been general manager for a long period. He was selected when only 32 to take charge of the company's factory, then just established, at Witton. This was the beginning of the large group of electrical engineering works owned by the General Electric in England.

## *E. W. Kramer Appointed to New Position*

Edwin W. Kramer, hydro-electric engineer of the California district of the U. S. Forest Service, has been made district engineer, succeeding Frank E. Bonner, who has been appointed secretary of the Federal Power Commission at Washington, D. C.

Mr. Kramer, who received his civil engineering degree from Cornell University, has been an officer of the Forest Service for 22 years. He has had extensive experience in engineering work in the East under the War Department and in water-power projects in Montana, Idaho, Washington, Oregon and California. For four years he was district engineer of the North Pacific district of the Forest Service with headquarters at Missoula, Mont., and he also served as representative of the Department of Agriculture on an interdepartmental board appointed to investigate certain water-power projects in California in which irrigation played an important part. In his new position Mr. Kramer becomes the representative of the Federal Power Commission in the California district.

R. P. WAITE has joined the Central Power Company, Grand Island, Neb., in the position of general superintendent.

C. C. SLATER resigned as president and general manager of the Columbus Railway, Power & Light Company, Columbus, Ohio, at a meeting of the board of directors held July 1. Benjamin W. Marr, who has been chairman of the board of directors, was named to succeed Mr. Slater. Dr. W. O. Thompson, president emeritus of Ohio State University, was chosen as a director. Other directors chosen were Karl Burr, attorney, who succeeds the late Lyle Babbit; William Wolls, who has been commercial manager of the company, and Morgan Evans, formerly assistant general superintendent. A. C. Beck, who has been connected with the company for several years, was chosen secretary and treasurer. Mr. Slater came to the company in 1919. He was made vice-president and general manager when Cyrus Eaton interests purchased control of the company from Charles L. Kurtz in 1923. In 1928 he was made president.

JAMES MCCLYMONT, a prominent figure in the electric appliance field for the past ten years, has severed his relations with the Winchester Repeating Arms Company and as vice-president and sales manager of the Whirldry Corporation. Prior to entering the electrical industry, Mr. McClymont was actively identified with the manufacture of lithographic printing machinery as vice-president and manager of the Hall Printing Press Company. In entering the electrical field, he immediately became known for his progressive and aggressive distributing and merchandising activities as treasurer and manager of the Laundryette Sales Company. He later had a large part in the development of the Savage Arms Company washer and drier and as sales manager of this branch of this business had the satisfaction of seeing the company become a real factor in the appliance field. His activities during the past five years as vice-president and sales manager of the Winchester Whirldry operation have further demonstrated his sales and executive ability. He has not made his future plans known.

# Obituary

HERR C. BAUR, a leading Swiss authority on electric cables, died recently at Zurich at the age of 72.

HARRY W. BROWN, for nearly 30 years incandescent lamp and meter specialist in the New England headquarters sales office of the General Electric Company at Boston, died July 24 at his home in Winchester, Mass. He was 56 years of age and was graduated from the Massachusetts Institute of Technology in 1896. Until his retirement several years ago on account of ill health he spent his entire business life with the foregoing company and was one of the best-known electrical men in the New England territory.

FREDERICK E. WEBSTER, vice-president and treasurer of the American Commonwealth Power & Light Company and affiliated companies, with headquarters in St. Louis, Mo., died suddenly at Saranac Lake, N. Y., July 24, in his fifty-seventh year. He was motoring home from a vacation spent at York Harbor, Me. Formerly secretary of the New Hampshire Public Service Commission, Mr. Webster in 1913 associated himself with David A. Belden, who heads the companies of which Mr. Webster was vice-president.

CHARLES W. KINCAID, II, special engineer in the industrial motor engineering department of the Westinghouse Electric & Manufacturing Company, died July 14 at his home in Pittsburgh following a long illness. Mr. Kincaid was born in Pittsburgh in 1889 and was graduated in 1910 from the University of Pittsburgh with the degree of electrical engineer. He entered the employ of the Westinghouse company in the same year, and in his nineteen years' service with that organization held successively positions as alternating-current motor designer, section engineer on alternating-current motors and consulting specialist on industrial problems.

# Financial and Statistical News

MIDDLE WEST UTILITIES' projected distribution of rights and stock split, followed by the sensational market rise in the Insull stocks, provided the week's feature. Middle West common jumped almost 110 points in two days, bringing it over 300 points above the year's low. One session brought Commonwealth Edison up over 50 points.

——NUMEROUS RUMORS OF IMPENDING MERGERS and other readjustments in the utility field continue to make the rounds, with consequent effect upon market quotations. Several independent units are in prospect of being tied in with one or another of the groups later this year and numerous capital adjustments are now under way.

——IN THE FACE OF 10 PER CENT MONEY and month-end settlements the market showed unusual buoyancy this week, especially for midsummer.

## Large Gains in June Revenue Are Indicated

June revenue of the electric light and power industry was 10 per cent greater in 1929 than in 1928, according to the showing made by those companies for which reports have thus far been received by the ELECTRICAL WORLD. These returns represent about 30 per cent of the total for the United States and seem to constitute a fair cross-section of the industry. Others yet to be received are expected to show approximately the same average gains. The figure was considerably exceeded in a number of cases not confined to any particular section of the country.

## Electric Investors Rides the Tide

Riding the tide of the recent buoyant public utility market, Electric Investors, Inc., provides a remarkably good example of the possibilities involved in the investment trust principle. Having access to the information in possession of one of the leading utility groups, the management has naturally been able to pick a group of stocks whose appreciation was relatively assured. The assets of the company have expanded 35 per cent since the end of last year.

Analysis of the portfolio of Electric Investors as of June 30 discloses a list of utility stocks virtually all of which have shown a steady appreciation and some of which have shown a very rapid appreciation over recent months. The list includes many of the most representative and thoroughly seasoned utility companies, covering virtually every section of the country, as well as other countries. The company also has smaller holdings in other utilities and in other lines of business and industry. Apparently well over 90 per cent, however, is in utility securities.

The assets of the organization amounted to $36,229,198 at the end of 1927. At the end of 1928 they had increased to $46,428,722, and at June 30, 1929, to $62,774,813. Net earnings for the same period increased from less than $4,000,000 at the end of 1927 to $12,272,028 for the twelve months ended June 30, 1929. Since all securities are carried at cost, the balance sheet and profit and loss statements do not show the enhancement in the market value over the book value of the securities owned, but the excess of market value over book value available for common stock is shown elsewhere to be over $100,000,000. Surplus as of June 30 amounted to $15,565,951.

In view of this exceedingly strong position, it is not surprising that the stock of the company has shown a very rapid appreciation. The low for the year to date is $77½ and the high $283. The market value of net assets per share of common stock outstanding at June 30 was $143.52.

## Larger Consumption of Electricity in Great Britain

Consumption of electric current in Great Britain totaled 7,602,000,000 kw.-hr. in 1928, an increase of 752,000,000, or about 10 per cent, over 1927, according to returns recently made to the Electricity Commissioners by the authorized supply undertakings, including private companies and municipal plants, the Department of Commerce learns from Trade Commissioner Homer S. Fox, London. The consumption of electricity in Great Britain has more than doubled in the last six years, the 1928 figure comparing with 3,645,000,000 kw.-hr. in 1922.

# Principles Applicable to Consolidation and Merger of Public Utilities

AN INTERESTING discussion of legal principles applicable to consolidations in the public utility field was recently published by the New York University Law Review under the name of William M. Wherry, member of the New York bar. Economic and legal aspects of the case are dealt with in some detail.

As the writer points out, this general tendency to combine is due to advantages in operation and financing. "As population increases savings can be made by operating for long distances from larger centers and eliminating duplications in central stations and transmissions." The advantages, it is pointed out, inure as much to the benefit of the consumer as to that of the owner of the property.

It is pointed out, however, that apart from these advantages there has been a most favorable money market for financing. It is also important that at the time this favorable security market became apparent a number of important court decisions protecting public utility properties from confiscation were rendered. "They restored public confidence in the security of these investments. The public, now ready to buy these securities, was not at all interested in participating in the management or the responsibility. The investors wanted only to share in the prosperity of the utility, now secured to it by court decisions against confiscation. It therefore became possible to distribute utility ownership widely by means of stock with restricted voting power, keeping the management concentrated and efficient.

"The reason why the owners were willing to distribute their ownership in this way was that they could not otherwise reap the benefit of higher values and secure higher rates in accordance with the decisions of the courts establishing their rights to such higher values and rates without reorganizing their financial structures and distributing a large part of their capital surpluses." While the benefits have been more obvious in the case of owners than consumers, the author maintains that the consumers have benefited materially in many cases through customer ownership.

The author then outlines the disadvantages to be guarded against in the merger movement: "One, the sale of a public utility, whether brought about through direct sale of the properties or through indirect sale by a change of ownership in its securities, may result in an injury to the patron by impairing the service, or, two, an injury to the purchaser of the new securities

if they are issued at excessive valuations or upon an improper financial structure.

"The sale of a public utility property direct cannot be made without the commission first approving it. This covers many of the cases, but not the great majority. As a matter of fact, consolidation today is usually a matter of change in the ownership of securities and is brought about by the device of holding companies which acquire the local utilities and issue their own securities in exchange for them. The holding company is generally a foreign corporation and the issuance of its securities is not subject to the control of the public service commissions.

"There has been considerable discussion as to whether public service commissions should have any control over the security issues of public utilities, the contention being that fraudulent issues can be regulated best by the so-called 'blue sky' laws."

### Function of Public Service Commission

The author then discusses the principles which must govern the exercise by a public service commission of its power to pass in advance upon the change in ownership of a public utility. The function of the commission, it is shown, is a preventive one. As to new issues, of course, the commission cannot refuse to approve the securities merely because it thinks their issue unwise. Such action, it is shown, is arbitrary and would be set aside by the courts. "The right to buy and sell freely is the essential element of property value. Any limitation of this right is a taking away of value. So long as the owners of the property exercise their right of dealing with it, managing it in a way which does not injure the public, their action in effecting a consolidation or sale cannot be interfered with by the state.

"An illustration of the principle that the commission cannot substitute its judgment for that of the directors in questions relating purely to internal management is shown in connection with the issuance of no-par stock in substitution for par stock. This substitution cannot affect the customer, nor can it affect adversely the investor, so that if the commission should interfere and refuse to approve the substitution, its action would merely be arbitrary and would be set aside by the courts.

"Many cases could be cited from public service commissions where the commission put the burden on the utility to show some affirmative benefits from the action contemplated. This is clearly a violation of the fundamental principle that the powers of the commission are powers to regulate and not to manage."

The author also discusses the situation which has frequently arisen when commissions have made the granting of their consent to consolidations the means of imposing conditions upon the company. The potential dangers of such a situation are discussed.

# Middle West Utilities Rebuilds Its Capital Structure

OFFICERS of the Middle West Utilities Company this week announced their intention to make a large distribution of rights to stockholders and subsequently to split the stock on a ten-for-one basis. The issue of rights is to be on the basis of one share at $200 for each four shares held.

Press reports on Monday of this week announced the distribution to be around $67,000,000. This was based on the fact that current quotations were more than $150 a share above the price of $200 at which shareholders were to be enabled to buy one share for each four held. One session's trading, however, brought the market up some 45 points, making the total distribution on this basis close to $90,000,000. The total moved up rapidly in subsequent trading sessions.

The Middle West Utilities system has shown almost phenomenal growth during the past decade and is now one of the largest utility systems in the world. It serves a large territory throughout the Middle West and has recently acquired substantial holdings in New England and the East.

The new capital adjustment involves a complete revamping of the capital structure. In addition to the increase in capital stock the plan includes the calling of all prior lien and preferred stock of the company and the retirement of its funded debt. The program in detail follows:

The 8 per cent prior lien and 8 per cent preferred stocks will be called for redemption.

To provide funds for this purpose common stock will be offered to all classes of stockholders at $200 per share on the basis of one share for each four shares of all classes now held. This issue of common stock will realize approximately $95,000,000. This will also provide funds for the redemption of $10,000,000 in serial gold notes bearing maturity date of August 1, 1930.

In view of the decreased value of their pre-emptive common stock subscription rights which will result from the proposed increase in the number of shares of common stock, it is proposed to call for redemption the $6 dividend series non-par prior lien and preferred stocks. Funds for this purpose and for the retirement of the remaining $10,000,000 in serial gold notes bearing maturity date of August 1, 1931, will be provided out of an issue of 550,000 shares of $6 preferred stock carrying subscription warrants for common stock. The terms of these warrants necessarily cannot be determined until after the stockholders' meeting.

It is proposed to give all present prior lien and preferred stock holders, both 8 per cent and $6 classes, "rights" to subscribe to one share of the $6 preferred stock carrying common stock subscription warrants, for each two shares of prior lien and preferred stock now held. The company will accept their present certificates on the basis of the call price in exchange not only for the new $6 preferred stock but also for such common stock at $200 per share as the certificates will take up and to which the stockholder has the right. Dividends on the new $6 preferred stock will be paid in cash or in common stock, at the option of the holder.

A ten-for-one split-up will be made in the common stock outstanding after the exercise of the rights to subscribe at $200 per share. The split-up of the common stock will be made on or shortly after the date of expiration of the rights to subscribe to the additional common stock at $200 per share and to the new $6 preferred stock with warrants attached. The redemption date of the present prior lien and preferred stocks will be somewhat later.

After the common stock split-up, dividends on common stock will be paid in the form of common stock at the annual rate of 8 per cent of the number of shares held. For example, the holder of 100 shares will receive a dividend thereon two shares quarterly or eight shares annually.

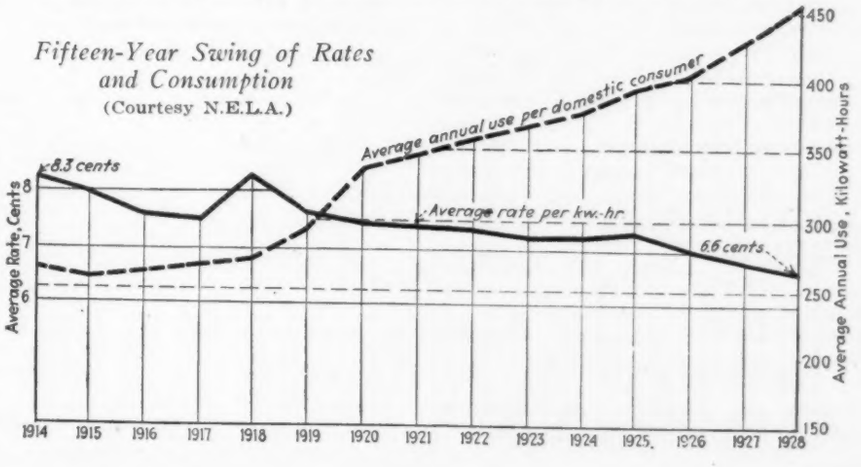
If this financial program is carried out it is planned to apply for listing the company's stocks on the New York Stock Exchange.

The program as a whole will be operative immediately upon assent of the stockholders to the necessary charter amendment at their meeting on September 16.

## Electric Rates Decline as Consumption Increases

*Fifteen-Year Swing of Rates and Consumption*

(Courtesy N.E.L.A.)



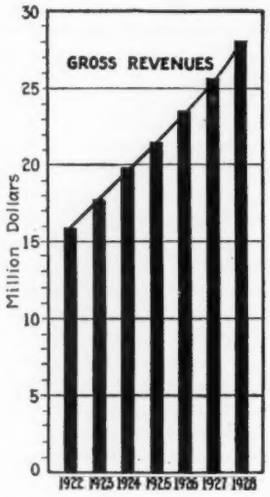
# Skillful Management Reflected in Boston Edison Operations

FORTY-FOUR years of operation in a diversified territory with metropolitan Boston as a nucleus has provided the Edison Electric Illuminating Company of Boston with an opportunity for development which has placed this property in the front rank of the major independent systems of the country. Last year's growth, while not spectacular, reveals gratifying gains in gross and net earnings and illustrates that substantial progress which builds a financial structure of strength and durability.

In 1928 electric operating revenues increased to $27,749,657 from $25,886,945 in 1927, a gain of 7.2 per cent. Net operating revenue rose from $15,036,993 to $16,501,391. The 1928 operating ratio was 54.5 per cent, compared with 56.8 per cent in the previous year, representing a gratifying advance in economic status from an already excellent index of business and engineering efficiency, accentuated by the fact that the company generated in steam plants over 91 per cent of its total output delivered to the bus.

The 1928 dividends of $6,406,500 were $12 per share of $100 par value and the net earnings per share available for dividends, depreciation reserve and surplus were $19.64, compared with $18.42 in 1927. Last year the dividends were earned 1.63 times, against 1.54 times in the previous twelvemonth. After the payment of dividends the balance to depreciation and surplus was $4,080,251, a gain of $838,350 during the year. At the current price of around $330 the stock sells at about seventeen times net earnings, which is considerably out of line with quotations on not a few other light and power investments of demonstrated strength. The strategic position of Boston Edison in the New England situation is virtually impregnable and its recent interconnection contract with the New England Power Association brings the two greatest utility organizations of these states into closer operating liaison than ever before. The Edison company is in a position to take advantage of virtually any changes in the New England electrical set-up which can be foreseen.

The financial set-up of the company December 31, 1928, consisted of 533,875 shares of common stock of $100 par value and an issue of $30,000,000 in coupon notes due November 1, 1930. At the close of last year plant investment and unfinished construction amounted to about $5.05 per dollar of gross revenue. The total generated output last year was 810,533,300 kw.-hr., and in addition the company purchased 77,273,437 kw.-hr.




*Gross Revenue Shows an Accelerating Rate at Boston*

CONSOLIDATED GAS OFFERS RIGHTS—Directors of the Consolidated Gas Company have voted to offer 10 per cent additional common stock to stockholders at $75 a share. The stock will be offered to shareholders of record September 16, in the ratio of one new share to every ten now held, subject to approval of the Public Service Commission. It is planned to issue the new stock by October 16. The company now has outstanding approximately 10,400,000 common shares. The additional stock will bring into the treasury approximately $78,000,000.

MAP OF SERVICE AREAS.—A map recently issued by Emanuel & Company, New York, shows in outline the territory served by the principal utility companies in the United States. Nearly 250 companies are listed and their annual revenue is given.

NORTH AMERICAN LIGHT ISSUE OVERSUBSCRIBED—The initial issue of common stock of the North American Light & Power Company was made this week, consisting of 200,000 shares at $47.50 a share. According to the bankers, orders for more than ten times the amount of stock offered were received in advance and $75 has been bid in the over-the-counter market for the stock. The American Light & Power Company, a holding company in which both the Insull and North American interests are associated, is issuing a total of 400,000 shares of common, half of which is represented by this offering and the balance is being placed in the voting trust in which the 1,006,400 common shares already outstanding are held.

CUSTOMER-OWNERSHIP SALE SUCCESSFUL—The 1,500 shares of 6 per cent cumulative preferred stock which were offered recently by the Rockville-Willimantic Lighting Company to its customers were oversubscribed within three days after the announcement. The sale of the stock was effected by employees of the company under the customer-ownership plan and supervision of P. H. Whiting & Company, Inc., New York City. The 92 employees of the company made sales to 466 customers for an average of three shares per order, thus securing a wide distribution.

## *New Security Issues of Electric Service Companies in July*

| Name of Company | Amount of Issue (Par Value) | Period, Years | Class | Purpose | Interest Rate | Price | Per Cent Yield |
|---|---|---|---|---|---|---|---|
| Central States Power & Light Corp. | $1,900,000 | .. | Preferred stock | To provide part of the funds with which to make payment for properties and leases being acquired | 7 | 95 | 7.35 |
| Cities Service Power & Light Co. | 20,000,000 | 20 | Gold debentures | To provide funds or to reimburse company for acquisition or retirement of funded debt or preferred stocks of subsidiaries and to retire short-term indebtedness of the company | 5½ | 93 | 6.12 |
| Federal Public Service Company | 4,250,000 | 18 | First lien gold bonds | To raise funds for the acquisition of additional subsidiaries | 6 | 95 | 6.46 |
| Long Island Lighting Co. | 4,000,000 | .. | Cumulative preferred stock | To reimburse company for expenditures made for additions, extensions and improvements to the properties of the company and for other corporate purposes | 6 | 100 | 6 |
| General Public Service Corp. | 10,000,000 | 10 | Convertible gold debentures | To provide funds for the increase of the company's investments | 5½ | 102 | 5.24 |
| North American Light & Power Co. | 9,500,000 | | Common stock | To raise funds for additional investments | .. | 47½ | .... |
| Total | $45,650,000 | | | Rights | $150,570,860 | | |
| Total amount actually realized | $48,142,500 | | | Total financing for July | $198,713,360 | | |

# Business News and Market Conditions

## New N.E.M.A. Divisional Set-Up

THE new divisional set-up of the National Electrical Manufacturers' Association demonstrates a high degree of flexibility and co-ordination in association management. It is designed chiefly to assist and co-ordinate section activities. The following outlines gives the sections affiliated with each of the ten N.E.M.A. divisions:

*Insulating Material Division*—Electrical porcelain, laminated phenolic products, manufactured electrical mica, molded insulation, vulcanized fiber.

*Appliance Division*—Carbon arc lamp, electric range and water heating, fan motor, heating appliance.

*Radio Division*—Power supply, receiver, transmitter, vacuum tube.

*Refrigeration Division*—Domestic refrigeration, commercial refrigeration.

*Transmission and Primary Distribution Division*—High-voltage insulator, switchgear, transformer.

*Utilization and Control Division*—Air circuit breaker, carbon, electric measuring instrument, industrial control, mining and industrial locomotive, motor and generator, panelboard and distribution board, signaling apparatus, storage battery.

*Wiring Devices Division*—Attachment plug, fuse, knife and inclosed switch, lamp receptacle and socket, snap switch.

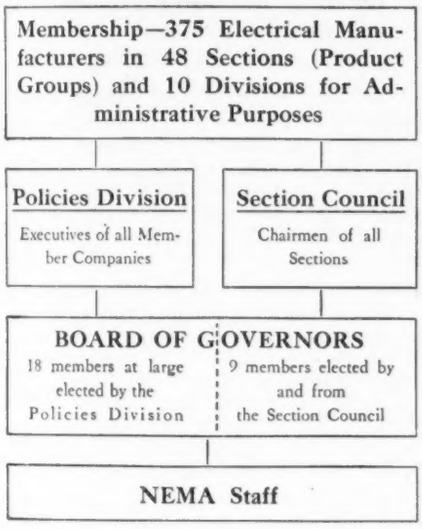
*Wiring Materials Division*—Armored conductor and metallic flexible conduit, conduit fittings, electrical porcelain, metal molding, non-metallic conduit, non-metallic sheathed cable, outlet box and switch box, rigid conduit, wire and cable.

*Industrial Heating Division*—Electric welding, melting furnace, oven, resistance type furnace.

*Lighting Division*—Commercial lighting, exterior lighting, electric sign, industrial lighting, street lighting.

*Overhead Trolley Line Materials Section* (not affiliated with any division).

### NEMA Organization Diagram


Membership—375 Electrical Manufacturers in 48 Sections (Product Groups) and 10 Divisions for Administrative Purposes
Policies Division
Executives of all Member Companies
Section Council
Chairmen of all Sections
BOARD OF GOVERNORS
18 members at large elected by the Policies Division
9 members elected by and from the Section Council
NEMA Staff

## Copper Sentiment Improves

A marked improvement in the appearance of the copper market has been a feature of the past week. Sales in both domestic and foreign markets have shown a decided advance. Zinc and tin quotations are firm with very little consumer buying. Lead has been somewhat more active, though price changes in this market appear to rest largely upon the trend of prices on the London Metal Exchange.

NEW YORK METAL MARKET PRICES

| | July 24, 1929 Cents per Pound | July 31, 1929 Cents per Pound |
|---|---|---|
| Copper, electrolytic | 18 | 18 |
| Lead, Am. S. & R. price | 6.75 | 6.75 |
| Antimony | 8⅞ | 8.625 |
| Nickel, ingot | 35 | 35 |
| Zinc, spot | 7.10 | 7.15 |
| Tin, Straits | 47.375 | 47.25 |
| Aluminum, 99 per cent. | 24.30 | 24.30 |

Base copper wire price July 31, 1929, 19¼ cents.

## Diesel Engine Manufacturers Organize Association

Realizing the need for closer contact with each other and with the problems of the user, a group of the leading manufacturers of Diesel engines in the United States have formed the Diesel Engine Manufacturers' Association, with offices at 30 Church Street, New York, N. Y. Twelve of the leading builders, representing practically the entire output of Diesel engines in the United States, are responsible for the organization. The association states as its primary object the advancement of Diesel power in America and a broad program of cooperation with users of this power.

Probably the greatest benefit to the users of Diesel power will come through the development of suitable standards of manufacturing and engineering practice. Such active problems as specifications for all fuels, wider distribution of accepted fuels and similar subjects will have the attention of the manufacturers.

In addition to encouraging the wider use of this prime mover the manufacturers are also giving more attention to better Diesel power plant design. Although the Diesel engine is a very simple type of prime mover, its satisfactory operation depends on good plant layout. Cooling water and lubrication are especially important in this field and the layout of cooling water systems has come in for considerable study. The use of lubricating oil purifiers of various types and the development of completely automatic lubrication systems have eliminated difficulties in plant operation.

The following manufacturers are members of the association: New London Ship & Engine Works, Electric Boat Company, Worthington Pump & Machinery Corporation, Fulton Iron Works, Ingersoll-Rand Company, Fairbanks-Morse & Company, Nordberg Manufacturing Company, I. P. Morris and DeLaVergne, Inc., Winton Engine Company, Cooper-Bessemer Corporation, McIntosh & Seymour Corporation, Busch-Sulzer Brothers Diesel Engine Company, Hooven, Owens, Rentschler Company.

The president of the association is Henry R. Sutphen, president of the Electric Boat Company. E. T. Fishwick, vice-president of the Worthington Pump & Machinery Corporation, is vice-president of the association and Harlan A. Pratt, manager oil and gas engine department, Ingersoll-Rand Company, is secretary-treasurer. The association also employs M. J. Reed as research engineer.

## *Delinquent Electrical Accounts*

| Division | June 1928 | June 1929 | Per Cent Increase or Decrease | Six Months 1928 | Six Months 1929 | Per Cent Increase or Decrease |
|---|---|---|---|---|---|---|
| New York | 322 | 212 | —34.1 | 1,870 | 1,467 | —21.5 |
| Middle and Southern Atlantic | 156 | 195 | +25. | 1,134 | 975 | —14 |
| New England | 118 | 143 | +21.2 | 753 | 969 | +28.7 |
| Central | 681 | 673 | — 1.2 | 4,966 | 3,892 | —21.6 |
| Total | 1,277 | 1,223 | — 4.2 | 8,723 | 7,303 | —16.3 |

TOTAL AMOUNTS REPORTED

| | June 1928 | June 1929 | Per Cent Increase or Decrease | Six Months 1928 | Six Months 1929 | Per Cent Increase or Decrease |
|---|---|---|---|---|---|---|
| New York | $50,541 | $38,632 | —23.5 | $269,003 | $342,561 | +27.3 |
| Middle and Southern Atlantic | 14,673 | 24,499 | +86.9 | 143,118 | 140,832 | — 1.6 |
| New England | 14,804 | 21,822 | +47.4 | 96,262 | 131,309 | +36.4 |
| Central | 84,674 | 83,771 | — 1. | 599,633 | 485,523 | —19. |
| Total | $164,693 | $168,724 | + 2.4 | $1,108,016 | $1,100,225 | — .7 |

# Market Conditions

MIDSUMMER SLACKNESS evident in equipment buying; inquiries falling off somewhat, but volume of business still up to par. Substation apparatus accounts for bulk of business in Eastern district.

——SOUTHEASTERN BUSINESS SOMEWHAT DULL; street-lighting improvements under way in several sections.

——NEW CONSTRUCTION MATERIALS ACTIVE IN NEW ENGLAND; meter sales doubled.

——MIDDLE WEST BUYERS TAKING CONSERVATIVE ATTITUDE; construction fairly active.

——PACIFIC COAST REPORTS SEVEN MONTHS' BUSINESS below 1928 total; pole business and inquiries good.

## EASTERN DISTRICT

BUSINESS shows a tendency toward lessened activity in the Eastern district. Central-station account, while still showing a satisfactory volume of commitments, gives signs of easing through a reduced volume of inquiries. Current orders are centered largely in substation apparatus, and further buying is expected for this phase of service.

A power company in Indiana has contracted with a New York manufacturer for a quantity of oil circuit breakers to cost $120,000. A central station in Ohio has ordered similar equipment to an amount of $45,000. A northern New York power utility has placed a commitment for transformers, switches and accessory apparatus to the sum of $30,000, while another central station in that same territory has purchased transformers and auxiliaries to cost $75,000. The call for prime movers is light and little business is expected in this line until the fall season. Inquiries for steel towers for transmission service have fallen off, but business in wood poles for distributing lines is reported as fair.

A manufacturer of electrical equipment for industrial service says that large orders are growing scarce but small commitments are holding up well. Motor account is easily the leader in industrial demand. Iron and steel mills, as well as larger metal-working plants in the New York and New Jersey sections, have been placing orders for industrial motors, controls and allied equipment, and there is further business in sight. Fractional-horsepower motors are in demand from talking machine and washing machine manufacturers. A maker of fuses reports a good demand from jobbing interests and says that July account shows improvement over the preceding 30 to 60 days. Electric pumping machinery for mining service is at an active status and other electric-operated mining machinery, particularly for copper properties, is engaging under improved demand.

The call for electric railway equipment continues as a factor in the present market. The Reading Company, Philadelphia, is beginning the electrification of its line from Wayne Junction to Lansdale, Pa., as a part of its $20,000,000 electrification program on suburban lines in this territory. The Delaware, Lackawanna & Western Railroad Company is commencing the electrification of its suburban lines at Morristown, N. J. A Pennsylvania manufacturer of rotating beacons for airport service is securing a volume of business and has contracted for a 2,000-cp. unit and other airport lighting apparatus for an Alabama city to cost $20,000. The demand for ornamental street-lighting units shows improvement. Construction projects are as follows:

The Westinghouse Lamp Works, Inc., New York, plans additions to its plant at Bloomfield, N. J., to cost $500,000. The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., contemplates an electrical equipment plant in the New York district, to cost $600,000. The New York Power & Light Corporation, Albany, N. Y., plans a hydro-electric generating plant on the Hudson River, near Hudson Falls, to cost $6,000,000, with transmission system. The Quaker Maid Company, New York, will build a food products plant at Terre Haute, Ind., to cost $400,000. The Kee-Lox Manufacturing Company, Rochester, N. Y., will build an addition to its carbon paper mill to cost $70,000. The General Analine Works, Rensselaer, N. Y., will build an addition to cost $200,000. The Anaconda Wire & Cable Company, Hastings, N. Y., will make expansions at its local mill, to cost $1,500,000. The Irving Airchute Company, Buffalo, N. Y., plans a plant at Los Angeles, Calif., to cost $100,000. The New York State Electric Corporation, Ithaca, N. Y., plans a power plant addition, to cost $150,000. The Tung-Sol Lamp Works, Inc., Newark, N. J., plans an addition to its radio tube-manufacturing plant, to cost $125,000. The Essex County Board of Vocational Education, Newark, N. J., has authorized bids for a boys' vocational school at Bloomfield, to cost $650,000. The North Jersey District Water Supply Commission, Newark, N. J., has authorized bids for electric motors, switchboards, substation equipment, etc., for the Wanaque Aqueduct, to cost $100,000. The Standard Oil Company of New Jersey, New York, will build a storage and distributing plant at Atlantic Highlands, N. J., to cost $200,000. The Grinnell Company, Philadelphia, will build a plant for the manufacture of fire extinguishers, to cost $125,000. The Girard Smelting & Refining Company, Philadelphia, plans an addition to cost $140,000. E. I. du Pont de Nemours & Company, Wilmington, Del., will build an addition to the generating plant at its chemical works at Belle, W. Va., to cost $150,000. The General Purchasing Officer, Panama Canal, Washington, will receive bids until August 19 for air compressors, electrodes and other equipment (Schedule 1980.)

## NEW ENGLAND

OUTSTANDING in the New England district is the movement of new construction materials. Pole-line supplies are moving in good volume. Extension of service lines in northern New England are numerous and reflect many large shipments of meters and line accessories.

During the past few weeks meter sales have doubled the normal volume, according to reports. Cable, wire, and pole orders are encouraging. Reports from Maine districts indicate that business conditions are improving in industrial centers. In eastern Massachusetts new mercantile buildings and schoolhouse projects are stimulating interest in interior electric lighting. Industrial equipment sales are receding and small motor orders dropped in volume during the past week, but the total to date this year is above that of last year. Central-station supplies are spotty, while orders have dropped for transformers and small switch and control orders were fewer last week. Restocking, on the other hand, continues steadily and replacement orders placed recently are in greater volume than last year.

## SOUTHEAST

GENERAL business conditions, while somewhat dull in Florida and spotty in Alabama and portions of South Georgia, are on the whole good in the northern half of Georgia. Interest here and there is being shown in improved street lighting, as indicated by an order for $50,000 worth of "white-way" standards from Mobile, Ala., with small orders throughout the section.

Textile mills were quite active, a supply order of $10,000 representing the principal item along this line. Purchase by utility companies continue to be the principal item for heavy materials, one order for approximately 200,000 lb. of copper wire being placed, with miscellaneous supplies amounting to $10,000. Prospects are excellent for a large order of modern type disconnecting switches and other safety devices for high-tension line operations. Building activity in Atlanta continues at a high rate and is resulting in supply trade considerably above normal. Negotiations were announced for a cold storage plant to be located over the railroad in the center of the city of Atlanta. This plant will

call for heavy purchases of electrical supplies and apparatus. Small socket devices are in reasonable demand with fan sales up to 30 per cent above normal. Campaigns by a number of power companies are taking electric ranges in considerable volume, jobbers delivering an average of more than 50 ranges per day, with prospects that this volume will pick up in the next two weeks. Construction projects are as follows:

The Louisville Gas & Electric Corporation, Louisville, Ky., and the Columbia Gas & Electric Company, Cincinnati, Ohio, plan a joint steel tower transmission line between Louisville and Cincinnati, to cost $700,000. The Chattanooga Coca-Cola Bottling Company, Chattanooga, Tenn., will build a plant to cost $100,000. The Knoxville Iron Company, Knoxville, Tenn., will make expansions to cost $150,000. Asheville, N. C., plans a floodlighting system and beacon lamps at the proposed municipal airport at Fletcher, N. C. The Southern Steel Works, Birmingham, Ala., will make extensions to cost $200,000. The Lamson & Sessions Bolt Company, Cleveland, will build a plant at North Birmingham, Ala., to cost $200,000. The Mueller Company, Decatur, Ill., will build a factory branch and distributing plant for brass goods at Atlanta, Ga., to cost $100,000. The United States Cold Storage Company, Chicago, plans a cold storage and refrigerating plant at Atlanta, Ga., to cost $1,000,000. The China-American Tobacco Company, Valdosta, Ga., plans an addition to its redrying, storage and distributing plant, to cost $200,000. The Ha-Boy Metal Products Company, Jacksonville, Fla., will make extensions to cost $75,000. St. Petersburg, Fla., plans a floodlighting system and beacon lamps at its proposed municipal airport.

## St. Louis District

None of the large firms have checked up the July business, but all interviewed think it will be ahead of July last year and prospects indicate a continuance of good business in the St. Louis district.

An order was received from a Western mining company for two synchronous motor-generator sets with control panels for $25,000, another order from the same locality was for a lot of 5- and 10-hp. mill motors and a 100-kva. transformer, all to cost $1,200, and an order aggregating $3,500 was placed for part of the electrical equipment of a large flour mill. Jobbers say that shipments of pole-line materials equal that of previous reports. Construction projects are as follows:

The Sugar Creek Creamery Company, Cape Girardeau, Mo., will build an addition to cost $100,000. Joplin, Mo., plans an ornamental lighting system. Heavener, Okla., plans a floodlighting system and beacon lamps at its proposed municipal airport. The Banfield Brothers Packing Company, Tulsa, Okla., will soon take bids for an addition to its meat packing plant, to cost $200,000. The Inland Waterways Corporation, Helena, Ark., plans a grain elevator and transfer terminal to cost $130,000. Brady, Tex., plans a floodlighting system and beacon lamps at its proposed municipal airport to cost $75,000. Denton, Tex., plans an electric power and light plant to cost $50,000. The Gulf Refining Company, Houston, Tex., plans an oil storage and distributing plant to cost $150,000. The Hurricane Motor Company, Houston, Tex., plans an aircraft engine plant to cost $250,000. The Standard Oil Company of Louisiana, Baton Rouge, La., plans extensions and improvements in its oil refinery to cost $8,000,000.

## Pacific Coast

July business is reported as slightly below that of June on the Pacific Coast and about 10 per cent lower for 1929 than for the first seven months of 1928, despite increased copper wire prices. Steel prices on conduit, boxes and the like have increased and copper is 10 per cent over last year's level so the net result is due to decreased business.

Power purchasing is largely for machinery, but includes a carload each of copper wire and pole hardware. Pole inquiries are especially good, including scattered cars for various small jobs and five assorted carloads for the Colusa, Calif., district. Range business is also good, Westinghouse reporting jobbers' orders for five cars well distributed along the coast. Miscellaneous orders cover a $20,000 street-lighting contract for Monterey, Calif., a traffic signal system for Alameda, Calif.; $2,000 worth of reactors for an Arizona copper mine and a $1,500 switchboard for a Sierra mine. Other machinery orders cover a $2,500 switchboard for an oil company at Martinez, Calif., a 350-hp. motor and controls for Honolulu; an $18,000 automatic switching equipment for San Francisco and $35,000 worth of motor-generator sets for a steel company. New substations are to be built at Moneta and Compton in southern California and the Pacific Gas & Electric Company has bought a General Electric switch house for San Francisco. The week's outstanding order covers $210,000 worth of Westinghouse transformers for southern California. Sales of meters, small motors and small transformers are brisk.

Central-station buying continued light in the Puget Sound district, but anticipated activity is about due. Industrial buying, particularly from lumber mills and woodworking plants, showed a slight improvement. On August 8 the Tacoma Board of Contracts and Awards will open bids for grading of a penstock line, power house site and railroad spur and for surge tanks and penstocks with appurtenances complete in place on the Lake Cushman hydro-electric project No. 2. The British Columbia Electric Railway Company, Victoria, B. C., is calling for bids for a turbine for the Jordan River hydro-electric plant and for 2 miles of steel pipe and the Power Corporation of Canada, Montreal, plans the expenditure of $500,000 on the hydro-electric project on the American Creek near Stewart, B. C. Specifications will be out shortly for motors and control apparatus for a veneer plant in Tacoma to be built by the Raymond Veneer Company, and the city of Seattle is expected to award a contract within two weeks for about $48,000 worth of electrical machinery, including motors and control for a West Spokane Street bridge. The sales reported involve three 15,000-volt oil circuit breakers and miscellaneous central-station equipment, the latter costing $5,000, for an industrial plant in the Puget Sound district; 30 motors for a lumber mill in eastern Washington, a half dozen pumps and motors for a pulp and paper mill, ten motors for a woodworking plant in Port Angeles and four machines for a mine in Alaska. The city of Seattle bought suspension insulators and clevices costing $8,400. Specifications for electrical equipment, motors and control for a plywood plant in Longview being built by the M. & M. Plywood Corporation are expected shortly. Construction projects are as follows:

Los Angeles and Inglewood, Calif., Roswell, N. Mex., and Salt Lake City, Utah, plan ornamental lighting systems. The Standard Auto Body Works, Los Angeles, will build an addition to cost $65,000. The Western Oil Company, Los Angeles, will build a gasoline refining plant in the Wilmington district, to cost $3,000,000. The Ryan Fruit Company, Logan, Utah, plans a cold storage and refrigerating plant, to cost $60.000. The Western States Grocery Company, Ogden, Utah, plans a storage and distributing plant to cost $200,000.

## Middle West

Industrial activity continues somewhat spotty, although generally satisfactory in the Middle West. Steel operations are at a high rate with a slight reduction in automotive production noted. The railroads continue their purchasing of equipment and car loadings are high and well diversified. An increase in construction activities is noted among the utility companies with some purchasing of apparatus going on. For the most part the conservative attitude of gradual expansion is being maintained.

Interesting orders placed include one for extension to a substation to cost $32,000, an addition to a substation amounting to $22,000, 25 600-amp., 15-kv., wheel-mounted, solenoid-operated oil circuit breakers, 1,100 precast reinforced steel concrete tower footings, 1,000 tons of reinforcing steel, 150 tons of structural steel, two complete river transmission towers and several construction orders aggregating $70,000. Jobbers' sales are normal. Manufacturers of code wire announced a reduction in price of approximately 10 per cent, while manufacturers of BX advanced their prices to $1.50 per thousand feet. Construction projects are as follows:

The Menasha Products Company, Menasha, Wis., plans an addition to its paper products plant, to cost $125,000. The Medusa Portland Cement Company, Cleveland, contemplates a mill at Charlevoix, Mich., to cost $400,000. The American Wire Cloth Company, Kalamazoo, Mich., plans a mill to cost $65,000. The Harvey Paper Products Company, Kalamazoo,

Mich., plans an addition to cost $70,000. The Allied Motor Industries, Inc., Detroit, plans extensions in its aircraft engine plant at Marysville, Mich., to cost $600,000. The Detroit Edison Company, Detroit, will build a power substation at Monroe, Mich., to cost $40,000. Tecumseh, Mich., contemplates a municipal light and power plant. Lyon & Healy, Inc., Chicago, will build an addition to its musical instrument plant for storage and distributing service to cost $200,000. Moline, Ill., plans a floodlighting system and beacon lamps at its proposed municipal airport, project to cost $150,000. The International Harvester Company, Chicago, will build an addition to its plant at Rock Island, Ill., to cost $130,000. The Commerce Garage Company, Cincinnati, Ohio, plans an automobile service, repair and garage building, to cost $500,000. The Champion Coated Paper Company, Hamilton, Ohio, plans a power plant with initial capacity of 19,000 kw. The Continental Grain Company, Minneapolis, Minn., will build a grain elevator to cost $100,000. The National Tea Company, Minneapolis, Minn., plans a factory to cost $160,000. St. Paul, Minn., and Dubuque, Iowa, plan ornamental lighting systems. Rock Rapids, Iowa, plans the purchase of a generator and auxiliary equipment for its light and power plant.

# Activities of the Trade

## Allis-Chalmers Reports Increase for Second Quarter

The Allis-Chalmers Manufacturing Company reports for the quarter ended June 30, 1929, a net profit of $1,165,713 after depreciation, federal taxes, etc., equivalent to $4.07 a share (par $100) earned on 285,999 shares of stock. This compares with $1,013,375, or $3.65 a share, on 277,636 average number of shares outstanding in preceding quarter and $804,407, or $3.09 a share, on 260,000 shares in the June quarter of 1928.

Net profit for six months ended June 30, 1929, totaled $2,179,088 after above charges, equal to $7.72 a share on 282,265 average number of shares, comparing with $1,480,007, or $5.69 a share, on 260,000 shares in the first half of the previous year.

Unfilled orders on June 30, 1929, amounted to $15,657,566, compared with $12,998,553 on March 31 and $10,148,287 on June 30, 1928.

Bookings for the second quarter of 1929 were $14,762,806, as compared with $9,153,785 in the second quarter of the previous year. Six months' bookings totaled $28,022,998, against $17,524,322 in the first half of 1928.

Statement for quarter ended June 30, 1929, compares as follows:

| | 1929 | 1928 |
|---|---|---|
| Sales billed | $12,103,793 | $8,979,359 |
| *Net profit | 1,165,713 | 804,407 |
| Six months ended June 30: | | |
| Sales billed | $22,046,646 | $17,394,612 |
| *Net profit | 2,179,088 | 1,480,007 |

*After depreciation, federal taxes and other reserves

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ELECTROL, INC., 170 Dorcas Street, St. Louis, manufacturer of oil burners, announces that Leon D. Becker has been elected president of its organization. W. T. Koken, who has been president of Electrol since 1925, becomes chairman of the board. M. E. Simpson, formerly general manager of the Electrol Distributing Corporation, which has been merged with Electrol, Inc., becomes vice-president in charge of sales. L. L. Jacobs continues as vice-president and general manager. H. A. Kunitz has been appointed chief of research engineering and Lewis L. Scott, a vice-president, continues as general consultant on patents and engineering. The executive and sales offices will be moved to 227 East 45th Street, New York City, but the factory will remain at St. Louis.

THE STANDARD ELECTRIC STOVE COMPANY, Toledo, Ohio, announces that Listenwalter & Gough of San Francisco and Los Angeles have become wholesale distributors for its company, serving the state of California. The Sterling Electric Company, Minneapolis, Minn., and the Korsmeyer Company, Lincoln, Neb., have taken on the products of the company as wholesale distributors.

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## American Bosch Shows Increased Profit

The American Bosch Magneto Corporation reports for the six months ended June 30, 1929, a net profit of $373,361 after depreciation, federal taxes, etc., equivalent to $1.80 a share earned on 207,399 no-par shares of stock. In the first six months of 1928, the company reported a profit of $103,454 after charges and depreciation, but before federal taxes.

Net profit for the June quarter was $150,169, after federal taxes, equal to 72 cents a share, comparing with $223,192, or $1.08 a share, in the preceding quarter. In the June quarter of 1928 profit before federal taxes amounted to $32,178.

Income account for the six months ended June 30, 1929, compares as follows:

| | 1929 | 1928 |
|---|---|---|
| Net sales | $4,955,336 | $5,518,045 |
| Profit after depreciation | 405,246 | 103,454 |
| Federal taxes | 31,884 | ..... |
| Net profit | $373,361 | *$103,454 |
| Quarter ended June 30: | | |
| Net sales | $2,156,627 | $1,550,135 |
| Profit after depreciation | 150,169 | 32,178 |
| Net profit | $150,169 | *$32,178 |

*Before federal taxes.

## Eureka Vacuum Cleaner Report

The Eureka Vacuum Cleaner Company reports for the six months ended June 30, 1929, a net profit of $617,172 after expenses and federal taxes, equivalent to $2.24 a share earned on 276,000 shares of no-par stock. This compares with $505,553, or $1.83 a share, on 275,618 shares in the first six months of 1928.

Income account for the six months ended June 30, 1929, compares as follows:

| | 1929 | 1928 |
|---|---|---|
| Net sales | $5,300,926 | $5,301,217 |
| Gross profit | 3,960,826 | 3,942,508 |
| Expenses | 3,268,706 | 3,412,692 |
| Operating profit | $692,120 | $529,816 |
| Other income (net) | 9,212 | 44,676 |
| Total income | $701,332 | $574,492 |
| Federal taxes | 84,160 | 68,939 |
| Net profit | $617,172 | $505,553 |

*Debit.

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COPELAND PRODUCTS, INC., Detroit, manufacturer of electric refrigerators, reports for six months ended June 30, 1929, a net profit of $266,942 after depreciation, taxes and reserves, equivalent under the participating provisions of the shares to $1.66 a share on 101,992 no-par shares of class A stock and 41 cents a share on 231,782 no-par shares of class B stock. This compares with $227,394, or $1.55 a share, on class A and 30 cents a share on class B in the first half of 1928.

THE SQUARE D COMPANY, Detroit, manufacturer of electrical safety devices and switches, has appointed Ray D. Flatland as its representative in the Seattle territory, handling the Square D switch and industrial controller accounts.

THE WAGNER ELECTRIC CORPORATION, 6400 Plymouth Avenue, St. Louis, announces the addition of W. H. Kretz to its transformer sales division. He will travel the Southwest. Mr. Kretz was formerly Texas district representative for the Jeffery-Dewitt Insulator Company.

THE GENERAL ELECTRIC COMPANY announces that annual passes entitling the holder to inspect any of the many factories of its company were mailed to the 55,000 stockholders of the company with their dividend checks. The passes, signed by President Gerard Swope, are good until December 31. On the reverse side of the passes are listed the cities where the company has factories, with a brief summary of what is manufactured in each plant.

THE NATIONAL LUMBER & CREOSOTING COMPANY, Texarkana, Ark.-Tex., announces the appointment of Albert E. Ferguson as general sales manager of its company with offices at Texarkana, and St. Louis, Mo. Mr. Ferguson was formerly in charge of the St. Louis sales office of the National Lumber & Creosoting Company.

# New Equipment Available

## Inclosed Toggle Switch Is Rubber Mounted

A new, totally inclosed toggle type flush switch with rubber-mounted mechanism for exceedingly quiet operation has just been announced by Cutler-Hammer, Inc., Milwaukee. The mechanism is mounted on two rubber pads.

Included are such features as totally

inclosed mechanism to keep out dust, etc., long life, non-stubbing contact, compression type lubricated spring, extremely simple mechanism, and "Thermoplax," cold-molded insulating material for body and base. The quick-acting mechanism results in instantaneous contact as soon as the lever is moved. The lever is made to operate easily with any type switch plate.

This switch is made in single- and double-pole, three- and four-way types, furnishing with either black or brown operating levers and standard mounting throughout. The manufacturer describes this new addition to his line for use wherever quiet operation or inclosed mechanism is required.

## Time-Delay Device Replaces Relay

A new time-delay device announced by the General Electric Company is designed for use with manual operating levers of that company's type HA-2 and HC-2 for switchboard type oil circuit breakers. The new device can be used in place of a relay where a time delay, not necessarily exact or selective, is desired. It cannot be used with a breaker to start a motor on full voltage.

The complete device consists of a coil, a calibrating tube and a piston dash-pump. Current adjustment is made by setting the armature at the desired ampere value marked on the tube. Time delay is varied by changing the size of the opening in the piston valve.

The device can be obtained to replace instantaneous trip devices in operating levers of above types already installed.

## Tin Meter for Splicing Solder

A simple device for determining the percentage of tin in wiping solder has been developed by the New York Edison Company. Wiping solder used in splicing lead-covered cables is a mixture of tin and lead. The ease with which the hot solder can be diluted by the addition of pieces of lead sheath so as to produce a mixture to suit personal preference of the individual splicer has made this common practice. Recent investigations have shown that with solder of less than 35 per cent tin content the wipes will be porous. This makes it necessary to restrict the alteration of the solder by the splicer and has created a use for a convenient form of tin meter to determine the proportion of tin at any time.

The Nill tin meter is small and can be carried in one's pocket. Two marks on the stem indicate the limits of 35 per cent and 40 per cent of tin. Tests have shown the usual accuracy to be within 1 per cent. The meter has a length of $2\frac{1}{2}$ in. and weighs 2.73 oz.

The device is simply dropped into melted solder and the depth of the immersion as shown by the scale marks on the stem indicates the percentage of tin in the solder.

## "Workace" Electric Shaper

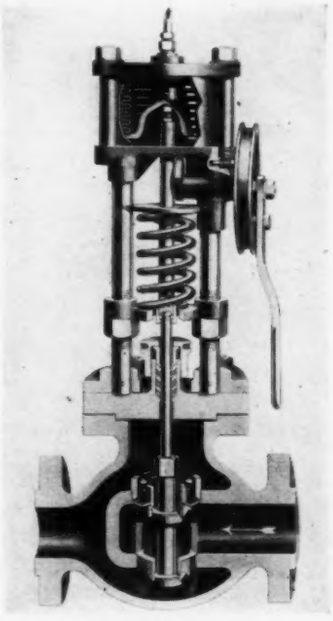
A newly designed portable electric shaper, marketed under the name "Workace," is announced by J. D. Wallace & Company of Chicago. The product is direct motor driven. The armature shaft and shaper spindle are integral. The belt has been eliminated to avoid slipping with the resultant slowing down of operation and loss of power. In other features of design and construction it is not unlike the latest larger shaper of high speed.

The "Workace" electric shaper has a no-load speed of 10,000 r.p.m. It is ball bearing; the means of lubrication are so designed that none of the excess oil can reach the motor. The excess is picked up and thrown by a slinger away from the armature shaft and drained outside of the housing.

This new electric shaper operates from a General Electric universal motor and can be used on the ordinary lighting circuit, 110 or 220 volts d.c. or a.c., 25 to 60 cycles. It weighs 42 lb.

## Thermo-Hydraulic Feed Water Regulator

A thermo-hydraulic feed water regulator which, it is claimed, embodies many new and improved features has just been announced by the Bailey Meter Company, Cleveland, Ohio. The valve is tight-seating, has scientifically designed V-ports and is fully balanced. In operation, these features result in freedom from danger of flooding boilers at low rates of steaming or when on bank, smooth, continuous feeding of boilers while in normal operation and



a positive, non-chattering action of the regulating valve, according to the manufacturer.

New features incorporated in the Bailey thermo-hydraulic generator, which is located at the boiler water level, are a cold water storage leg, a condensation by-pass and a vacuum seal. The cold water storage leg, together with a large, fin area of the generator tube, assures rapid condensation of steam in the annular space between the inner and outer generator tubes, which, in turn, results in positive closing of the regulating valve as the boiler water level tends to rise. Condensate which forms in the connecting piping between the generator and the boiler drum is returned to the boiler by means of the condensate by-pass. This prevents erratic and false operation of the regulating valve which would be caused if the condensate were allowed to drain back to the boiler through the generator. The vacuum seal causes instantaneous closing of the regulating valve in case the boiler water level ever exceeds the upper limit of variation allowed by the generator.

Bailey terminal hydraulic feed water regulators will be furnished to users in all pressure standards up to and including 1,350 lb.

# Electrical Patents

*Announced by U. S. Patent Office*

(Issued July 16, 1929)

1,721,419. DYNAMO-ELECTRIC MACHINE; J. H. Staak, Fort Wayne, Ind. App. filed Jan. 6, 1927.

1,721,420. LOW-CAPACITY SWITCH; O. Stürner, Berlin, Germany. App. filed Jan. 18, 1926.

1,721,477. SHOWER PIPE FOR PAPER OR PULP MACHINES; C. L. Spafford, Sherbrooke, Quebec, Can. App. filed March 8, 1927.

1,721,478. ELECTRIC SWITCHING; J. W. Stocking, Hollywood, Calif. App. filed Sept. 23, 1926.

1,721,493, 1,721,494, 1,721,495, 1,721,496 and 1,721,497. INCLOSED FUSED SWITCH; J. Sachs, West Hartford, Conn. Apps. filed Jan 13, 1922, Aug. 7, 1923, April 30, 1924, and July 18, 1927.

(Issued July 23, 1929)

1,721,503. CONDENSER AND PROCESS; W. H. Priess, Belmont, Mass. App. filed April 30, 1920.

1,721,515. COMMUTATOR; R. Kroehle, Warren, Ohio. App. filed Jan. 30, 1928.

1,721,566. LAMP GRIP SOCKET; J. Lofgren, Chicago, Ill. App. filed July 29, 1926.

1,721,582. VARIABLE HEAT-CONTROL MEANS FOR ELECTRICAL HEATERS; H. A. Ziola, Toledo, Ohio. App. filed June 11, 1927.

1,721,584. CIRCUIT BREAKER; J. M. Anderson, Brookline, Mass. App. filed Jan. 24, 1927.

1,721,585. ELECTRIC-CURRENT DISTRIBUTOR; F. W. Brooks, Sr., Virginia, Minn. App. filed July 25, 1927.

1,721,593. KNOCK-OUT FOR ELECTRIC JUNCTION BOXES, SWITCH BOXES, ETC.; S. Hammer, Brooklyn, N. Y. App. filed Dec. 16, 1926.

1,721,604. SIGNAL; G. W. Rapp, Louisville, Ky. App. filed Sept. 6, 1927.

1,721,657. INSULATOR; S. C. Cutter, Oswego, Ill. App. filed Dec. 2, 1926.

1,721,669. MAGNETO-OSCILLATING MECHANISM; B. P. Remy, Indianapolis, Ind. App. filed Aug. 8, 1927.

1,721,724. FIXTURE SUPPORT; E. G. Appleton, Chicago, Ill. App. filed April 6, 1928.

1,721,727. DISTRIBUTOR; E. A. Bohlman, Chicago, Ill. App. filed April 14, 1926.

1,721,730. REMOTE-CONTROLLED LOCK; H. E. Goss, Oakland, Calif. App. filed Dec. 20, 1926.

1,721,757. CIRCUIT CONNECTER; W. R. Walker, New Dorp, N. Y. App. filed Aug. 21, 1924.

1,721,775. COMBINED TRANSFORMER AND CONDUIT-BOX COVER; D. V. Fallon, Detroit, Mich. App. filed April 30, 1928.

1,721,795. INCUBATOR AND METHOD OF HATCHING CHICKENS; H. M. Shilstone, New Orleans, La. App. filed July 26, 1926.

1,721,840. FURNACE; I. B. Smith, Ambler, Pa. App. filed Oct. 30, 1925.

1,721,845. ARC LAMP AND METHOD OF MAINTAINING A UNIFORM LENGTH OF ARC; C. S. Ashcraft, Los Angeles, Calif. App. filed Aug. 1, 1921.

1,721,847. APPARATUS FOR TESTING THE DIELECTRIC STRENGTH OF INSULATING MATERIAL; A. O. Austin, Barberton, Ohio. App. filed March 1, 1923.

1,721,853. ELECTRIC-CURRENT REGULATOR; J. M. Boykow, Berlin-Lichterfelde-West, Germany. App. filed Nov. 1, 1926.

1,721,886. ELECTROLYTIC CELL; I. A. Shulimson, Springfield, Mass. App. filed Sept. 20, 1926.

1,721,995. ELECTROMAGNET; J. Harris, La Fayette, Ind. App. filed Sept. 18, 1924.

1,722,046. SHUNT BLOWOUT DEVICE; G. B. Fuller, Arkona, Ont., Can. App. filed July 22, 1927.

1,722,083. ELECTRICAL CONDENSER; J. C. Gabriel and G. M. Thurston, New York, N. Y. App. filed Aug. 26, 1924.

1,722,097. APPARATUS FOR SELECTIVELY CUTTING OUT A RECTIFIER WHEN FLASH-OVER OCCURS THEREIN; E. Kern, Wettingen, near Baden, Switzerland. App. filed Nov. 3, 1925.

1,722,117. CENTRIFUGAL SWITCH; P. Suter, Baden, Switzerland. App. filed Oct. 9, 1928.

1,722,126. CIGAR LIGHTER; W. Budds, Chicago, Ill. App. filed April 29, 1926.

1,722,146. ELECTRODE; W. Irby, Lynn, Mass. App. filed Jan. 7, 1927.

1,722,149. ELECTRICAL APPARATUS; J. Kubler, Baden, Switzerland. App. filed Feb. 7, 1929.

1,722,152. RECTIFYING SYSTEM; G. Meiners, Plotzensee, Germany. App. filed Feb. 26, 1927.

1,722,153. HIGH-TENSION CABLE; H. Meurer, Cologne, and S. Silbermann, Cologne-Porz, Germany. App. filed Aug. 6, 1928.

1,722,157. INDUCTION METER; W. H. Pratt, Lynn, Mass. App. filed June 29, 1926.

1,722,161. METHOD OF AND APPARATUS FOR MAKING INCANDESCENT LAMPS AND SIMILAR ARTICLES; R. F. Strickland, Cleveland Heights, Ohio. App. filed Dec. 4, 1926.

1,722,163. HIGH-TENSION CABLE; W. Vogel, Cologne-Mulheim, Germany. App. filed Aug. 13, 1928.

1,722,165. SWITCH MECHANISM; G. O. Watson, Rugby, England. App. filed April 12, 1927.

1,722,166. POWER-FACTOR REGULATOR; W. Weiler, Niederschonhausen, Berlin, Germany. App. filed April 16, 1927.

1,722,167. CURRENT TRANSFORMER; M. S. Wilson, Lynn, Mass. App. filed July 10, 1928.

1,722,176. INCANDESCENT LAMP; P. O. Cartun, Cleveland Heights, Ohio. App. filed May 12, 1926.

1,722,180. TWO-FILAMENT INCANDESCENT LAMP; R. N. Falge, Cleveland, Ohio. App. filed Aug. 17, 1921.

1,722,181. THREE-PHASE TRANSFORMER; H. R. Summerhayes, Schenectady, N. Y. App. filed Nov. 15, 1927.

1,722,194. SYSTEM OF DISTRIBUTION; H. D. Brown and C. A. Sabbah, Schenectady, N. Y. App. filed June 13, 1927.

1,722,195. METHOD OF ELECTRIC WELDING WIRES; W. D. Bumstead, Cleveland, and E. A. Aurada, Cleveland Heights, Ohio. App. filed April 23, 1928.

1,722,203. TERMINAL PROTECTOR HOOD; W. B. Day, Winchester, Ky. App. filed Jan. 18, 1924.

1,722,207. MEANS FOR SUPPRESSING HIGHER HARMONICS; H. Geise, Berlin-Oberschoneweide, Germany. App. filed July 31, 1928.

1,722,210. METHOD OF PREPARING BATTERIES FOR SERVICE; W. H. Grimditch, Philadelphia, Pa. App. filed March 5, 1923.

**Information on foreign patents can be obtained through the nearest district office of the Bureau of Foreign and Domestic Commerce, Department of Commerce.**

# New Trade Literature

OIL HEATING EQUIPMENT.—The Oil Heating Institute, 342 Madison Avenue, New York City, is distributing a catalog which describes and illustrates the oil heating equipment manufactured by members of the Oil Heating Institute. This equipment includes oil burners and equipment accessory to oil heating.

WAFFLE IRONS.—A pamphlet issued by Landers, Frary & Clark, New Britain, Conn., describes and illustrates the "Universal" waffle irons with heat indicators.

AMPERE-HOUR METERS. — The Sangamo Electric Company, Springfield, Ill., has issued bulletin No. 78, which covers its various types of ampere-hour meters, including type N for use with every type of storage battery installation; type NT, for motive power service; type NF, for switchboard mounting; types NCR and NCI, for railway car lighting service, and its NH type.

CONNECTORS.—The Delta-Star Electric Company, 2400 Block, Fulton Street, Chicago, is distributing bulletin No. 38-CC, which describes and illustrates its "Sumpter" compression type connectors for wire connections.

CORROSION. — The Brewer-Titchener Corporation, Cortland, N. Y., has issued a booklet entitled "Corrosion," which contains facts and figures covering actual corrosion tests on iron and steel conducted by organizations, individuals and industries.

COLORED SIGNAL GLASS.—The Corning Glass Works, Corning, N. Y., is distributing a booklet on practical considerations in the selection of standards for signal glass in the United States, reprinted from the *Proceedings* of the International Congress on Illumination.

RECTIFIERS.—A catalog issued by the B-L Electric Manufacturing Company, St. Louis, covers its complete line of rectifiers and assembled apparatus for distribution to radio and electrical jobbers. The catalog contains illustrations and descriptive matter of dry metallic rectifying elements and replacement units.

NICKEL CAST IRON.—"An Introduction to Nickel Cast Iron" is the title of bulletin No. 201-a issued by the International Nickel Company, Inc., 67 Wall Street, New York City. It contains a brief discussion of the position of cast iron in the engineering field, the trend toward improvements in physical and mechanical properties and the rôle of alloys in this connection. The company also is distributing bulletin No. 207, entitled "Properties and Applications of Nickel and Nickel-Chromium Cast Iron," which contains many important applications of nickel cast iron. Many examples of the economic value of the material are discussed and illustrated.

TREE WIRE.—The Simplex Wire & Cable Company, 201 Devonshire Street, Boston, is distributing a booklet covering its "Fibrex" tree wire.

CHOKE COILS, MOTOR CONTROLS, ETC.—The Pacific Electric Manufacturing Corporation, San Francisco, is distributing bulletin No. 23, which gives full details of the construction and specifications of choke coils, both the insulator mounted type and suspension type; bulletin No. 24 covers the Pacific Electric motor controls for air-break switches; bulletin No. 25 describes its type OA-1 current transformers for residual relays on grounded neutral systems; bulletin No. 26 contains drawings, dimensions and design layout of several typical steel switching substations for high-voltage power transmission systems and bulletin No. 27 covers its type BB-1 disconnecting switches.

POTHEADS.—Bulletin No. 31 issued by the G & W Specialty Company, 7780 Dante Avenue, Chicago, covers a new line of type T, capnut, outdoor, single-conductor potheads. The company also is distributing bulletin No. 30A, which tells some of the story of the company's testing equipment.

CENTRAL STATIONS.—"Modern Central Stations" is the title of a publication issued by the Ingersoll-Rand Company, 11 Broadway, New York City. This is the fifth volume of a series describing modern central stations and is made up of articles selected from the technical magazines and contains much information of value to engineers and others associated with the field of power generation.

TURBINES AND AUXILIARIES.—Bulletin No. 1644 issued by the Allis-Chalmers Manufacturing Company, Milwaukee, contains an illustrated review of record-establishing achievement in the design and manufacture of Allis-Chalmers hydraulic turbines and their auxiliaries.

SUPERHEATERS. — The Superheater Company, 17 East 42d Street, New York City, is distributing bulletin T-19, which describes and illustrates the "Elesco" multiple-loop, single-pass superheater. Typical adaptations to all types of boilers are shown.

# Foreign Trade Opportunities

**Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:**

An agency is desired in Copenhagen, Denmark (No. 39,873), for household electrical appliances.

Purchase is desired in Toronto, Canada (No. 39,926), of electric refrigerators.

Purchase is desired in Medan, Sumatra (No. 39,927), of electric signs.

Purchase is desired in Mexico City, Mexico (No. 39,808), of a wireless receiving and transmission station.

An agency is desired in Karachi, India (No. 39,810), for electrical wiring supplies.

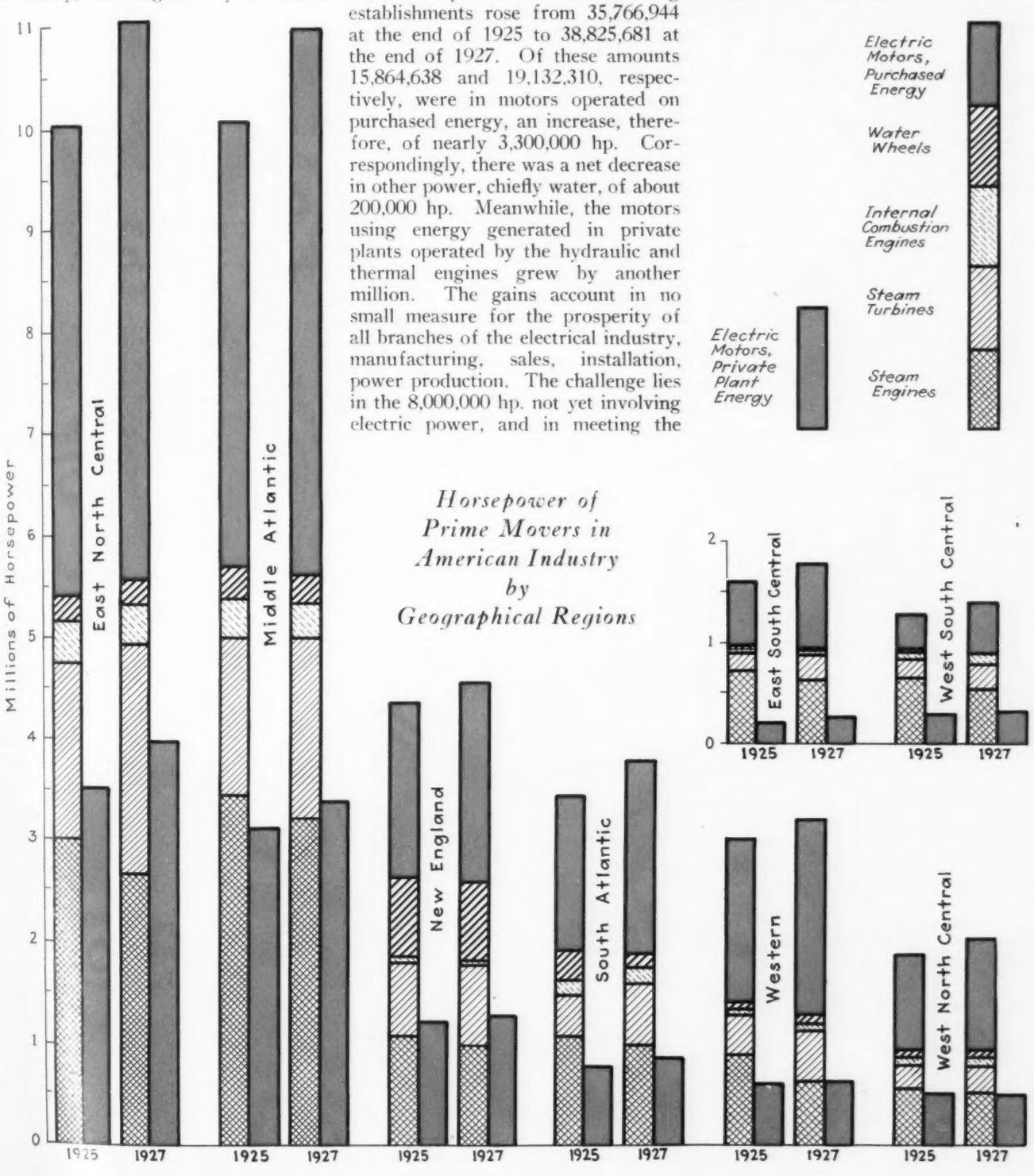
A sole agency is desired in Sydney, Australia (No. 39,809), for X-ray and electromedical apparatus.

# Business Facts for Electrical Men

**Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business**

## Room for Electric Power Growth Everywhere

THE present degree of electrification of industry—or, more correctly, the degree a year and a half ago—may be viewed both as a challenge and as an achievement. The total horsepower in manufacturing establishments rose from 35,766,944 at the end of 1925 to 38,825,681 at the end of 1927. Of these amounts 15,864,638 and 19,132,310, respectively, were in motors operated on purchased energy, an increase, therefore, of nearly 3,300,000 hp. Correspondingly, there was a net decrease in other power, chiefly water, of about 200,000 hp. Meanwhile, the motors using energy generated in private plants operated by the hydraulic and thermal engines grew by another million. The gains account in no small measure for the prosperity of all branches of the electrical industry, manufacturing, sales, installation, power production. The challenge lies in the 8,000,000 hp. not yet involving electric power, and in meeting the normal increase of over 1,500,000 hp. yearly. The situation by geographical divisions is shown on the chart.




*Horsepower of Prime Movers in American Industry by Geographical Regions*

# Abnormal Production in Middle Atlantic States

REPORTS received by the ELECTRICAL WORLD on the consumption of electrical energy by some 800 large manufacturing plants operating in the Middle Atlantic States indicates that the productive activity of these plants during June was of an unusually high order for this season of the year. The rate of operations during June was 0.7 per cent under May and was only 0.9 per cent under the February rate of activity. A study of operating data for past years indicates that normally a drop of around 10 per cent would be expected between February and June manufacturing operations in this section. The June rate of operations was also 14.2 per cent over June last year. During the first half of the year the rate of productive activity averaged 12.4 per cent over the same period last year.

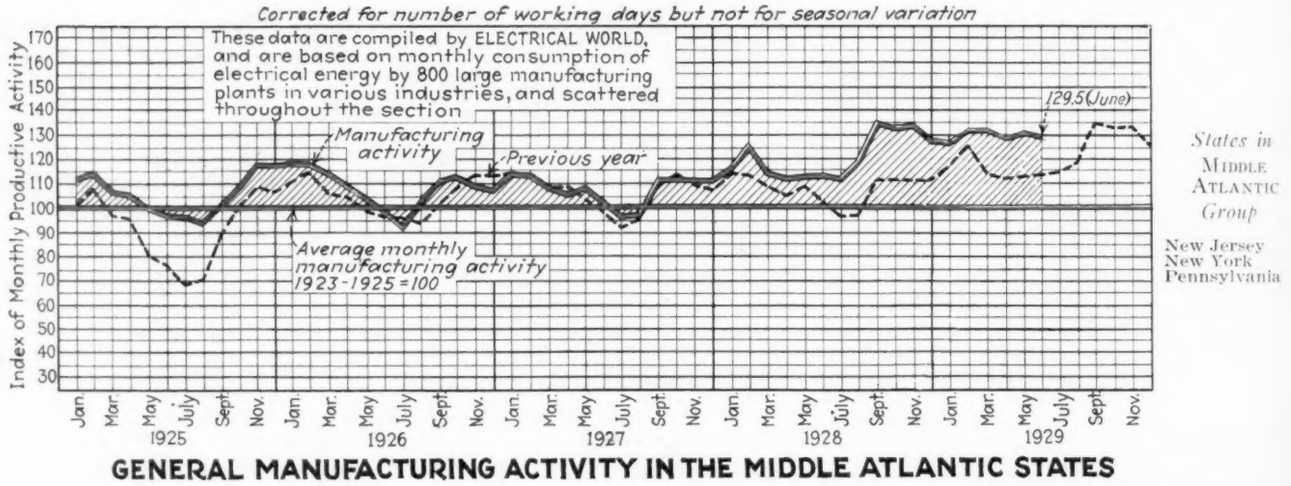
The greatest gains in activity over June last year were recorded by the rolling mills and steel plants, with a gain of 40.5 per cent; forest products, 39.7 per cent; textiles, 22.8 per cent; metal-working plants, 19.5 per cent, and chemicals and allied products with a gain of 14.2 per cent. The leather products, automobiles and paper industrial groups reported June operations under those of a year ago.

*Indexes of Productive Activity in the Middle Atlantic States*

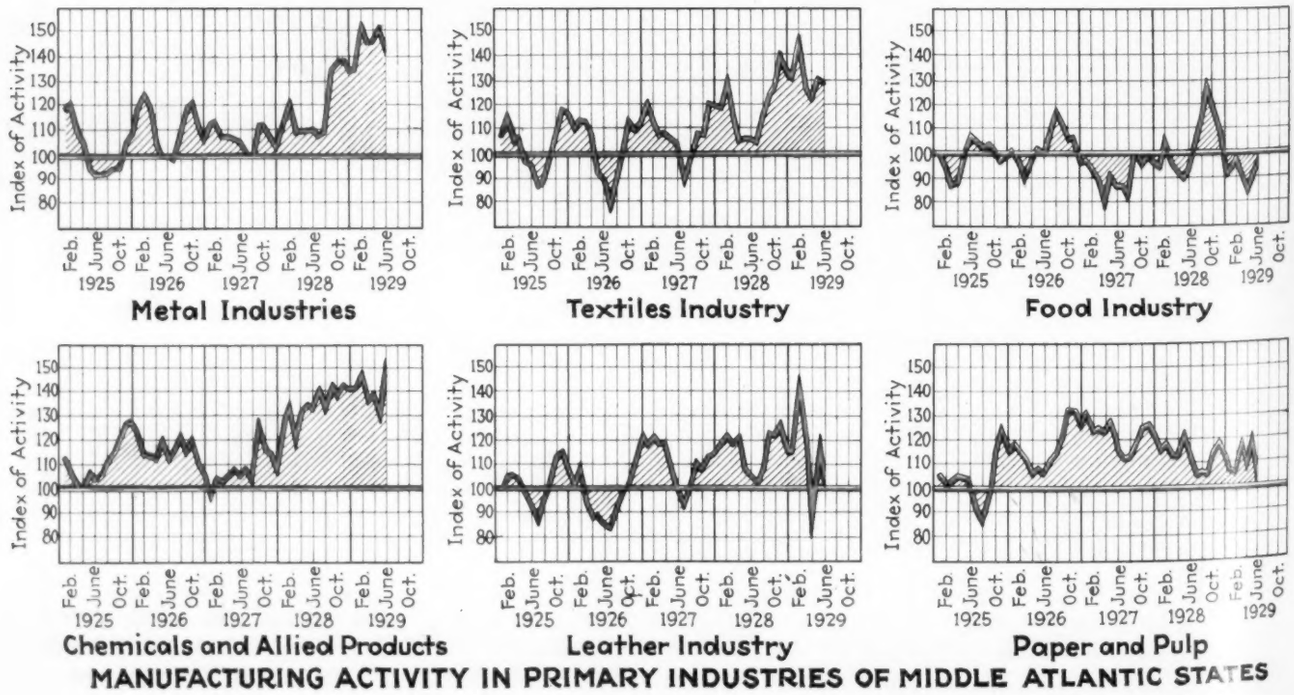
(All Figures Adjusted for Number of Working Days)

| | June, 1929 | May, 1929 | June, 1928 | Average First Six Months 1929 | Average First Six Months 1928 |
|---|---|---|---|---|---|
| All industries | 129.5 | 130.4 | 113.4 | 129.2 | 115.0 |
| Automobiles, including parts | 77.6 | 98.8 | 188.4 | 135.6 | 171.9 |
| Chemicals and allied products | 152.0 | 127.5 | 133.0 | 140.5 | 132.1 |
| Food products | 97.3 | 91.2 | 93.8 | 92.3 | 94.1 |
| Leather products | 100.0 | 121.8 | 105.2 | 113.6 | 115.5 |
| Forest products | 142.5 | 113.8 | 102.1 | 125.7 | 105.6 |
| Metal-working plants | 149.2 | 158.7 | 106.2 | 137.3 | 111.9 |
| Rolling mills and steel plants | 135.7 | 142.7 | 113.4 | 152.1 | 112.2 |
| Metals group | 142.8 | 150.8 | 109.7 | 144.9 | 112.0 |
| Paper and pulp | 101.0 | 122.2 | 111.8 | 110.4 | 115.1 |
| Stone, clay and glass | 149.2 | 141.8 | 132.8 | 139.2 | 121.4 |
| Textiles | 129.1 | 130.6 | 105.2 | 130.7 | 113.0 |

ELECTRICAL WORLD *Barometer of Industrial Activity in the Middle Atlantic States*


Corrected for number of working days but not for seasonal variation
These data are compiled by ELECTRICAL WORLD, and are based on monthly consumption of electrical energy by 800 large manufacturing plants in various industries, and scattered throughout the section
Manufacturing activity
Previous year
129.5 (June)
Average monthly manufacturing activity 1923-1925=100
Index of Monthly Productive Activity
States in MIDDLE ATLANTIC Group
New Jersey
New York
Pennsylvania
1925
1926
1927
1928
1929

GENERAL MANUFACTURING ACTIVITY IN THE MIDDLE ATLANTIC STATES




MANUFACTURING ACTIVITY IN PRIMARY INDUSTRIES OF MIDDLE ATLANTIC STATES